Agriculture in the Americas

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NAMES & NEWS

New Advisory Committee

The President has appointed an Advisory Committee for 1942–43 on Inter-American Cooperation in Agricultural Education to advise regarding agricultural education; to stimulate the interest of the land-grant colleges of the United States in inter-American studies and students; and to explain the aims of the proposed Institute of Tropical Agriculture. The members of the Committee are: *Dr. Thomas Barbour,* Director of the Museum of Comparative Zoology, Harvard University; *Dr. Ross E. Moore,* Assistant Director in Charge of Latin American Relations, U. S. Department of Agriculture; *Dr. Homer J. Henney,* Dean of Agriculture, Colorado State College; *Mr. H. Harold Hume,* Dean of the College of Agriculture, University of Florida; *Dr. John C. Patterson,* Chief of the Division of Inter-American Educational Relations in the U. S. Office of Education; *Mr. Knowles A. Ryerson,* Assistant Dean of the College of Agriculture, University of California, and Chairman of this Committee; *Dr. T. W. Schultz,* Iowa State College; *Mr. J. G. Lee, Jr.,* Dean of the College of Agriculture, Louisiana State University; and *Mr. Philip Leonard Green,* Latin American Specialist, Office of Foreign Agricultural Relations, and Secretary of the Committee.

Among the general matters considered by the Committee at the semiannual sessions on November 3 and 4 were the new Inter-American Institute of Agricultural Sciences and the program of in-service training in agriculture.

Noteworthy specific recommendations were the following: (1) that a list of practical texts on agriculture be prepared by the Office of Foreign Agricultural Relations and by the Office of the Division of Inter-American Educational Relations, and that this list be first circularized to the members of the Committee for suggestions and additions and then recommended for translation into the languages of Latin American countries; (2) that serious consideration be given to the question of scholarships for the study of agricultural subjects in this country by Latin Americans, to the end of adapting the facilities of United States agricultural institutions so that they can provide educational experiences of more value to the students from the other American Republics; (3) that it be recommended that certain of the large agricultural export industries, such as the banana industry, should, if possible, receive sufficient allocation of shipping space to permit the maintenance of their plantings to allow expansion immediately after the war or at any time during the war when the products become more important than at present to the war effort.

Finally, in consideration of the topics of cooperative experiment stations in other American Republics and the interchange of projects for agricultural research among similar institutions throughout the Americas, the Committee passed a resolution recommending that all agricultural investigation institutions in this country exchange project outlines with all other stations in the hemisphere doing similar kinds of work.

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Agriculture IN THE *Americas*

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The Technique of Plant Exchange

Plant introduction involves the preparation of plants for shipment and special care to restore them to full growth and vigor in a new environment. Climate and soil are the controlling factors.

by B. Y. MORRISON

There is nothing very new or strange about the exchange of plant materials between various parts of the world. History is full of references to persons who have ·d themselves seriously with the bringing of from foreign countries to their own, references ange from the letters of the humblest folk who carry home a strange plant as a souvenir, to kings who have commanded such explorations and cargoes.

On the window shelf in my office are potted plants the origins of which go back to Mexico, to Guatemala, to Brazil, to Argentina, to Bolivia, to the Union of South Africa, to Angola, to Abyssinia. None relate to the commercial or economic life of my own or any other country, but rather merely to man's innate love of plants and his facility in bringing them home, wherever that may be.

Yet the question of plant interchange is not one of sentiment or of desperation. It is merely a question of understanding those phases of plant life that permit us to work out techniques which will give us as swiftly as possible the power to speed up the processes of nature, who has her own powers of moving plant populations in her own inscrutable fashion over the face of the earth, within certain limitations of time and space.

We wish to exchange plants. How do we proceed? At base, we hunt for that portion or stage of the plant which will bear transport with a minimum of risk. The simplest examination shows us that it is the plant or plant part in a dormant condition, as represented in the seed, the bulb, the dormant shoot. After this we study all the gardener's practices to bring these to active life and growth in a new place. Out of deference to our community life we bow to certain inevitable and tiresome, if highly desirable, sanitary practices, and once having accomplished the establishment of our plant, we turn it over to others for commercial mass production or for scientific improvement.

Peach stocks and introductions in quarantine house at U.S. Plant Introduction Garden

Outdoor propagating frame.

What we have to concern ourselves with here, is essentially the technique of exchange. For this we must know: (1) the identity of the material; (2) the safe method of transport; (3) the quickest methods of establishment whether for immediate use or for reshipment.

For us in the United States this has meant the sending of plant materials back to our country from abroad after collection or purchase; their safe conduct through quarantine and propagation; and often, in these later years, the preparation of such material to send to other countries in return, a process that becomes more and more detailed and more and more interesting.

Possibly because we have been working at this for a long time, a review of our technique may be helpful and may serve to provide examples for nations other than our own, provided always that the examples are modified to suit local needs.

When plant materials are received in the United States for the use of Federal agencies, they are examined by competent inspectors of the sanitary branch of the service to prove and to record their freedom from disease and insects. This inspection is carried out in accordance with Federal regulations which determine not only these sanitary precautions but regulate as well the procedure to be followed in initiating the culture.

Acting jointly with these agents are officials of the bureau concerned with plant crops who are assigned to the plant introduction section. It is particularly of this division and its operation that I wish to write since its organization and operation represent the accumulated experience of about 40 years.

As originally conceived, it was designed to serve as the sole avenue for incoming materials and the sole agency for the preliminary testing and evaluation of new materials. Within its purposes and appropriations were plans and means for carrying out actual field explorations in any part of the world, to collect whatever materials might be needed to diversify or to improve agriculture within the United States and, to a limited degree, its possessions, attention being directed first to agencies of the Federal Government, second to State government agencies, and later to private scientific institutions and individuals engaged in scientific research. Its staff consisted of scientists trained in horticulture and botany. It included a unit in Washington, D. C., charged with planning the work and maintaining the historical records of each enterprise, a small unit for the reception and inspection of material, and various field stations where the plant materials were grown for test, evaluation, and later dissemination.

The one important activity of the Division, not explicitly expressed in its authority but implicit in its operation, has been the development of a service of exchange of plant materials, not only in countries where explorations have been conducted, but in nearly all countries which have come to know of this service.

There is nothing more natural than that the plant explorer away from home, with his keen and practiced eye, should talk with plantsmen abroad and propose sending to his companion of the moment something from the United States that might be useful in that other country. From this has grown up, over the years, a correspondence that has reached every quarter of the globe with varying degrees of activity, interest, and success.

In the pursuit of these exchanges it has always been the belief that science knows no limitations of race or territory and that we are free to work for the best ends of humanity as we and our correspondents might conceive them, leaving the business aspects to other specialists and basing our proposals on the fundamental premises that all men are brothers and that nature recognizes no boundaries or distinctions.

As an example of a type of activity that springs from the work of the Division and its associate agencies, is the study of quinine. With no regard to the history of this plant with all its aspects, both magnificent and tragic, one can say that now in this very time of stress, we have in our hands the opportunity, and if we all work together, the means, of bringing back to the Americas the development of a plant product of infinite value for the control of one of our most insidious and devastating diseases.

Because it represents the procedures as well as any other plant, let us consider the progress of a shipment of cinchona seed that comes to the Division, arriving by mail from the Philippines and bearing the name of *Cinchona Ledgeriana*. It is received at the Inspection House, where it is examined by the officials of the Bureau of Entomology and Plant Quarantine, is given a serial number, and is delivered to our Division. Its name is altered to *Cinchona officinalis*. Ledger's variety, which is more in accordance with botanical judgment. A sample is reserved for the seed collection against any future questioning, and the seed itself is sent to the Plant Introduction Garden.

There it is sown under the best conditions possible, using a technique of sowing which has given the best results after some eight years of experience. Within three weeks, if the seeds are fresh, there is a good germination, and the young seedlings are watched with more than paternal care, every precaution being taken to keep them in health and in a continuously growing condition. Carefully transplanted as needed, they are large enough in six months' time to be ready for shipment, under normal conditions of transport.

Before packing plants for shipment, special fumigation is given by a technique that has been perfected in the past decade, the necessary sanitary certificates are issued and recorded, and the little plants are ready to return nearer to their original home.

From this point on, the responsibility lies in the hands of the recipient, who must know as much or more than we. He must have ready the staff trained to receive the plants, restore whatever vitality may have been lost by the shock of shipment, and prepare them for nursery growth and later field planting—procedures that must be interpreted and modified according to the conditions in each country.

There is never any one safe formula for procedure, and the basic requirement in every country is the man who knows how to make a plant grow. This man need not be a highly trained scientist and, in fact, often is not; his success depends largely upon that inherent instinct which is as potent as an intellectual concept. In the United States we often speak of such a man as having green fingers; in the Philippines, I am told that he has "a warm hand." However we may describe him or whatever his training or experience, he must know how to make a plant grow and often he must know more; he must know how to make a plant grow in spite of everything—poor soil, unsuitable climate, over-anxious superior officers!

If he knows about cinchona, he will know that at home it is a tree, usually from a mixed forest, from the rainy side of the Andes, from elevations between 1,000 and 3,000 meters, with a preference for soils rich in humus, for rainfall throughout the year, for protection from winds, especially when young. Knowing all this, he will arrange his nursery work to approximate these conditions and meantime pray devoutly that his prosperous children need not be shipped off for planting in some politically advantageous spot that has none of these vital characteristics.

The story of each plant that comes to a plant introduction garden and that goes out from a plant introduction garden is the same in principle but may differ in detail.

What is a plant introduction garden? It is a place chosen as one might choose a farm, for its good soil, its desirable terrain, its abundant water and whatever other physical characteristics make it valuable in its community. On it are built whatever structures are needed to care for plants. At our largest garden we have greenhouses which are of three types: those planned and arranged for quarantine and detention, those specially designed for propagation practices, those for the continued growth of young plants whether in heat or in cold. These buildings are supplemented by office space, refrigeration and cool storage facilities (a feature

Detail of construction of a propagation house.

Detail of lath house.

General greenhouse range. Narrow house for propagation. Small houses for quarantine.

of prime importance when one receives plant materials from the opposite side of the equator), lath shade, and any other device of use in growing plants.

There are other factors that must enter into any study of the exchange of plants between the Americas besides these technical details which are related to the physical acts of growing and exchanging plants, seeds, roots, bulbs, cuttings, or the like. These other factors are the studies that must be made from two entirely distinct points of view, that of the botanist and that of the agriculturist.

The world in general is most likely to consider plant products rather than plants *per se*, and to know about plants as grown to produce these products, whether under the most primitive conditions that can barely be called cultural practices or under the most highly mechanized procedures. The man on the street is likely to forget the knowledge that the botanist may have, and because the botanist is usually a retiring person save in the special arena of taxonomy, his possible contribution is often underestimated.

This sort of thing is very much to be regretted at the present moment because many plant products are being suggested in all parts of the world as possible sources of this or that product, rubber, medicinals, fibers, and so on. If we all had perfected and completed our botanical studies, considering them in their broadest sense, we might have had much to offer soil conservation which that technique has had to learn for itself; to offer medicine, which has long looked to chemistry for her panaceas; and to offer the industries, which have also turned to synthetics rather than to natural sources for many raw materials. Because of this divorce of interest and attention, the modern botanist with too few exceptions is likely to concern himself only with the carcass of his plant and with his own pleasure in sorting out these remains into neatly articulated patterns for their identification.

Returning to our quinines, there are from eight to forty species and forms, depending upon the sort of botanist you are, and while even the most captious botanist will agree that all are quinine species, this is not enough for the pharmacist because he knows that some are rich and some are poor in the desired alkaloids. This knowledge, to be sure, is not what we would require of the botanist. We should like him to know all about the physical aspects of the tree, particularly in the range of its variability—all about the geographical range of the plant in nature, supported by field notes that would cover particularly the growth habits of the tree or shrub and its habits of natural propagation and dispersal. In these data often lies the solution of the gardener's problems and the clue for agronomic procedures and planning.

If such data were abundant now for all those plants native to the Americas from which commercial projects are derived—the oil palms, tonka beans, jalapa, sisal, yuca, pita, to name only a few—how much more swiftly we all might pass through the experimental period while we determine whether they are adaptable to the almost mechanized procedures of artificial cultivation, as has been done notably for cotton, sugarcane, and coffee.

Fundamental Needs

What then do we need? Fundamentally nothing more than a directive and directing technique founded not only upon knowledge of the dead plant, its name with its obituary-like description, but on an understanding of its normal, natural life that gives us the key to our procedures; and then that sensitive, trained technique that makes us partners with nature herself.

After this, we must pass on to those new techniques which for us, in our interchange of living plant materials, involve the problems of preparing plants for shipment and restoring them to full growth and vigor in a new environment.

We feel confident that with certain modifications each country in the Americas will find advantageous our organization for plant exchange. North American botanists would like to know those of Hispanic America, to see critical materials, to exchange opinions. We of the horticultural branch would like to establish close relationships with horticulturists to serve as the liaison officers between all the ramifications of Hispanic American service and our own.

Such interchange of work and study not only precedes but accompanies the interchange of plants, and we are certain that the present agreeable and pleasant relations between American scientists could be multiplied beyond any immediate concept.

More Rubber From Castilla?

An accidental discovery in Haiti that rubber latex can be coagulated inside the bark of the Castilla tree opens new possibilities of utilization through mechanical extraction. Such a development would avoid the large requirement of manual labor in rubber plantations.

by O. F. COOK

Rubber as a plant product is not in the same class with sugar, starch and cellulose, as a substance generally or necessarily involved in assimilation and structural growth. Rubber and similar "gums" are not confined to a single family of plants, and in the several groups where they occur the rubber materials are formed in different tissues and organs, the fruits, the leaves, the bark, or the roots. Thus each of the rubber-forming plants has its separate problems of structure, behavior, and cultural requirements. Scores of different trees, vines, and shrubs have contributed to the supplies of wild rubber, but only three of the rubber-bearers have reached an agricultural status in the sense of being planted, and of producing practical quantities of rubber from cultivated areas.

The Castilla or Central American rubber tree was the first to be planted on a scale of thousands of acres, in the later decades of the last century, in southern Mexico, before the Brazilian tree called Hevea began to be planted in the East Indies. Practical and economical methods of extracting the rubber latex were developed for Hevea, but not for Castilla, so that the Mexican plantations proved a failure, and the idea of planting Castilla was abandoned. The third agricultural rubber-bearer is guayule, a woody shrub growing in high-altitude deserts of northern Mexico and western Texas. Methods of mechanical extraction were developed for guayule, and it now appears that such methods may be applicable to the bark of the Castilla tree, with a prospect of obtaining larger yields of rubber from planted trees and even of recovering more rubber from wild trees than the previous methods have obtained.

The finding of rubber in the bark of decaying Castilla logs was noted in *Science*, April 23, 1937, "Rubber Production from Castilla and Hevea." The observation was made in March 1930 at Bayeux, near the north coast of Haiti, between Cap Haitien and Port de Paix. The trees had been felled nearly three years before, in July 1927. The rubber was in the form of slender elastic threads of a pale amber color. The discovery was accidental and unexpected, no good rubber having been found previously in dead Castilla bark, only a black sticky gum.

In other rubber trees, as Hevea and Funtumia, the bark dries promptly and shows elastic filaments when broken and pulled apart, but several trunks or branches of Castilla often remain alive for days or weeks, and changes take place that interfere with the formation of

An abandoned Castilla plantation in Panama forming a self-renewing forest with volunteer Castilla seedlings as undergrowth.

good rubber in the latex tubes. The usual failure of proper coagulation may be ascribed to the same oxydizing enzyme that has been recognized as causing much damage to Castilla rubber, staining it black and eventually reducing it to a soft adhesive inelastic paste.

The exceptional occurrence of good rubber in Castilla bark was ascribed to the fact that the logs were not shaded, but lay in an open place, where the trees had stood. With full exposure to the sun it seemed that the bark of these logs might have been heated enough to destroy the oxydizing enzyme and thus to permit a normal coagulation of rubber inside the latex tubes. Effects of exposing Castilla latex to the sun had been witnessed in the native method of coagulation in southern Mexico. The latex was spread on large smooth leaves of Calathea, which then were placed in the sun on open ground, where the latex coagulated in a few minutes. The rubber that was treated in this way proved later to be more durable than any samples obtained with various coagulating agents, moon-vine, lime-juice, soap, or chemicals, even where efforts were made to avoid discoloration by washing and creaming the latex, or by intensive washing of the freshly coagulated rubber. Some of the samples turned to paste in a few months, others in a few years, but no softening occurred in the sample coagulated in the sun. This native method of preparing Castilla rubber was observed in the Soconusco district of Chiapas in 1902, as described and illustrated in Bulletin 49, Bureau of Plant Industry, "Culture of the Central American Rubber Tree," 1903.

Latex Separate From Sap

Another fact relating to the enzyme was discovered in June 1907 in experimental tapping of Castilla trees in eastern Guatemala, on the Trece Aguas estate near Senahú, between Panzos and Cahabón. It was noted that occasional drops of latex exuded from the surfaces of the tapping wounds after removal of the scrap rubber, and that these drops did not show the usual separation of a brown liquid, nor the usual staining of the rubber.

These creamy white drops were observed repeatedly during the day, but no discoloration took place, and the latex eventually coagulated without darkening. The drops resulted, obviously, from some of the latex tubes losing their plugs of coagulated rubber when the "scrap" was pulled from the cuts. Considering these drops as samples of the latex as it exists in the tubes, the failure to show any of the discoloring fluid that gradually separates from latex in the tapping cuts of Castilla was specially noted. Thus the behavior of these unstaining drops of latex brought into question the general assumption that the enzyme is a normal constituent of the latex of the Castilla tree. It is known, of course, that the latex tubes are separate from the other tissues of the bark, but it appears that sap as well as latex exudes in the tapping cuts and that the two are mixed, to the detriment of the rubber.

Tapping cut in Castilla bark, with drops of permanently white latex exuding after removal of scrap rubber, the surface below the cut stained by previous flow of discoloring sap. Natural size.

In view of these facts, the incident in Haiti of finding the good rubber on the rotting logs, suggested possibilities which had not been recognized in the earlier investigations of the Castilla tree. Processes of mechanical extraction of rubber were being worked out for the guayule shrub, and no reason was apparent why such treatments were not applicable to the bark of Castilla. Although Castilla had proved altogether inferior to Hevea as a plantation tree, because the latex could not be extracted by the system of repeated tapping developed for Hevea, this would not mean that other methods of utilizing Castilla should not be considered. In view of the large requirements of labor in harvesting rubber from Hevea, interest would attach to any alternative possibilities of obtaining rubber from Castilla by mechanical extraction. To call attention to this need of further investigation of the Castilla tree was the object of the brief statement published in 1937.

The method of tapping by daily or frequent renewal of the same wound, as developed by Ridley for Hevea, is not applicable to Castilla because the latex tubes do not form a continuous network, which means that the bark pressure adjacent to the wound is not restored. But this limitation of Castilla does not affect the possibility of mechanical extraction of the rubber. Castilla apparently is not inferior in such production features as rapidity of growth of the trees, tolerance of adverse conditions in the juvenile period, resistance to disease, and thickness of the latex-bearing layer of the bark. Except that both are trees, Castilla and Hevea are

hardly more alike than the sugar cane and the sugar beet.

Comparison of Castilla with guayule may assist understanding of production possibilities. It was clear from the first with guayule that mechanical extraction was required, and after many years of experience a satisfactory process was worked out. The problem was difficult because the rubber-bearing cells of guayule are not in latex tubes but scattered through the tissues, so that much grinding was required to bring the minute particles of rubber together. The expedient of retting the finely ground material assists the separation of the rubber. With the Castilla bark containing coagulated strands of rubber the guayule process may be simplified, and such an adjustment may occasion little difficulty.

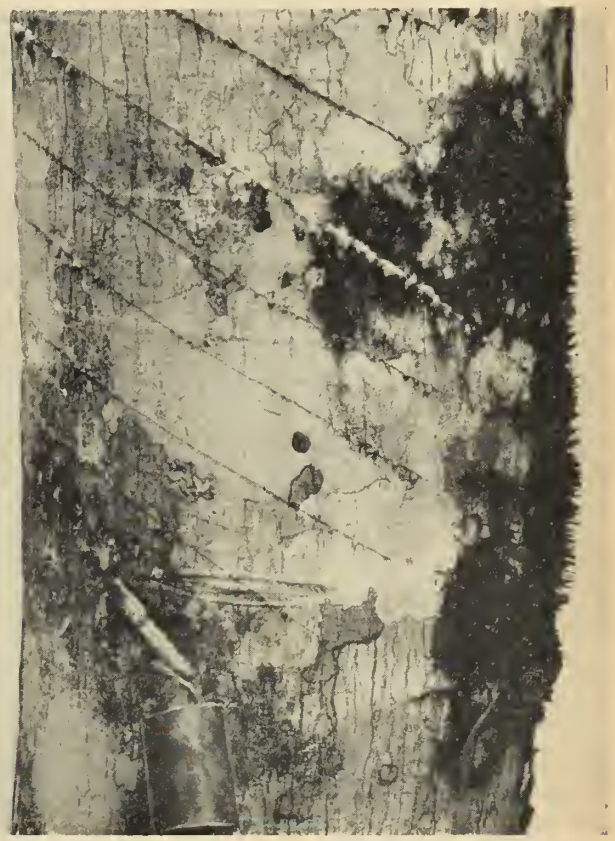
A wide range of cultural adaptation may be expected among the species of Castilla, in view of the natural distribution of the genus over most of tropical America from the latitude of Vera Cruz in Mexico through Central America, Panama, Colombia, Ecuador and Peru, across Bolivia and Brazil. But Castilla was not indigenous to the West Indies. Two kinds of Castilla had been introduced in Haiti near the beginning of the present century, probably representing *Castilla elastica*, indigenous in Mexico, and *Castilla panamensis*, a native of Panama. Early accounts of rubber, from the sixteenth century to the nineteenth, relate to Castilla. Even in the Amazon valley Castilla was the principal source of rubber until the middle of the last century, when the Hevea rubber began to be exploited on a large scale.

The reason for Castilla being exploited first was the free flow of the latex from the tapping cuts, furnishing more rubber with less labor. The method of tapping Castilla in South America is to fell the tree and then to ring the trunk and larger branches with many tapping cuts, usually a foot or more apart, sometimes only a few inches. Twenty to fifty pounds of rubber are credibly reported from single large trees, although the latex flows only to the extent of relieving the bark pressure, and several times as much rubber must be left in the bark.

Saving the larger quantity of rubber that in the past has been lost, is the possibility suggested by the discovery in Haiti of good rubber in decaying Castilla bark. Many abandoned Castilla plantations in Mexico and Central America have grown up as forests; here machinery for mechanical extraction might be utilized. But even with scattered trees, saving the rubber may not be impossible. Where the trees are felled as in South America, piling and burning a little brush around the logs may heat the bark enough to destroy the enzyme and coagulate the rubber, which then will remain unchanged for months, or even years. After a period of decay the inner rubber-bearing layers of the bark may be separated or the bark may soften enough for the threads of rubber to be pulled out, as from the logs in Haiti.

Other instances of latex coagulating in Castilla bark doubtless will be found, if not already reported. Logs that lie in clearings or in open fire-swept woodlands may contain rubber that can be salvaged. The logs in Haiti may have been scorched by a grass fire or in burning brush. Peeling the bark may be feasible, Castilla being one of the trees with bast in separable layers, used by primitive people for making "bark cloth." A stabilized Castilla industry doubtless would follow forestry methods in growing the trees and lumbering the trunks and branches to a mill for extraction of the rubber, with the bark fiber and the wood as by-products. The first mill operation would be a simple heat treatment to destroy the enzyme and coagulate the latex in the bark.

The behavior of Castilla in abandoned plantations in Mexico and Central America leaves no doubt of self-renewing Castilla forests being readily established. Other problems relate to the preservation, study, selection, and increase of the local types of trees, not only to salvage more rubber for the present emergency, but to determine and develop any possibilities of utilizing Castilla as a regular source of rubber in tropical America.



Trunk of Castilla tree in Guatemala, with drops of latex exuding from several superficial cuts. Note absence of latex above the short deep cut, where the bark pressure had been relieved.

El Salvador—Beehive of Activity

The smallest country and the most densely populated on the American mainland, El Salvador harbors an active and adaptable nation made up of many races. A rich heritage of agricultural wealth, a healthy record of self-help, and a concern for social welfare, make El Salvador an effective unit in the American family of nations.

by PHILIP LEONARD GREEN

It was on the Eve of the Holy Saviour that the conquistador Pedro de Alvarado and his doughty contingent of Spaniards overcame the Indians of Cuscutlán. That is how the capital city of San Salvador and the country, El Salvador, got their names.

The smallest in size of the continental American republics—it is about as large as the State of Maryland—El Salvador harbors a population of around 1,700,000. With 125 people to the square mile, it is the most densely inhabited republic on the American mainland. Over 80 percent of the inhabitants are of Indo-Hispanic stock, and the balance mostly Indians; but there is a small white aristocracy, descended from the Spanish conquistadores. The Indians speak Spanish. They are closely related to the life of the country and consider themselves an integral part of the nation.

In addition to the Spanish, other European nations are represented in the country's population. Among these are the British, French, Germans, and Italians. Some Italian families, for instance, have become particularly prominent in business. Chinese, Turks, and Armenians also engage in commerce in El Salvador. Though almost every foreign nation is represented in the country, over 80 percent of the commercial enterprises are in the hands of Salvadorans.

Courtesy of the Legation of El Salvador

Indian woman from Panchimalco.

The country has no outlet of its own on the Atlantic Ocean since it completely faces the Pacific. On the latter ocean it has five ports—La Libertad, La Unión, La Concordia, El Triunfo, and Acajutla. Of these, Acajutla and La Unión are connected by rail with the inland capital.

El Salvador was long neglected by the Spanish settlers, since it was somewhat out of the radius of the colonizing parties sent down from Mexico and up from Panama. Besides, it did not seem to be endowed with a wealth of precious metals. Upon separation from Spain in 1821, El Salvador joined the Central American Federation, but when Iturbide's Mexican Empire absorbed the union of Central American states, El Salvador parted company with it and sought annexation to the United States. This annexation never took place. In 1824, Iturbide's power collapsed, and El Salvador rejoined the federation. The country remained a member until 1841, when the federation was broken up, and joined again in 1921 during its short-lived revival of that year.

Most of El Salvador's notable progress has taken place within the last 60 years and is due to a happy combination of land and people.

The greater part of El Salvador's energetic inhabitants live in the healthful upland regions. Temperature there hovers around 73.6 degrees Fahrenheit, with only slight variations. The rainy season lasts from May to October.

Most of the country has fertile soil, made up of decomposed lava from the volcanoes. While corn takes

Imported bull from India bred to native cow gives good oxen, good beef cattle resistant to ticks.

up the largest area under cultivation, by far the most important crop of the land, as far as value is concerned, has been the coffee which accounts for over 70 percent —and in some years as high as 90 percent—of the country's agricultural exports. This crop, with which El Salvador is now so prominently identified in the world's markets as the third largest producer, had its origin in a coffee tree brought into the country by a Brazilian school teacher in 1840. Like other countries which based their national economies on the coffee bean, El Salvador suffered serious setbacks with the decline of world coffee prices. In 1940, El Salvador signed the Inter-American Coffee Agreement and since then has benefited by the orderly marketing of the main export which that agreement has promoted. But the country's leaders realize that more far-reaching economic planning is needed, so that El Salvador may, in the years to come, be less and less dependent on a single crop.

Increasing attention is therefore being given to henequen fiber, roselle fiber, cacao, rubber, sugar, cotton, tobacco, and other old and new sources of agricultural wealth. Little known, for instance, is the fact that the so-called "Peruvian balsam," used for medicinal purposes since Spanish Colonial times, really comes from the Libertad and Sonsonate regions of El Salvador.

Cattle are relatively numerous in El Salvador. Among the leading agricultural crops are the corn and beans which serve as staple foods for the poorer classes. The *níspero* is a fruit highly prized for its distinctive taste. Incidentally, the tree from which this fruit comes is also the source of a sap known commercially as *chicle*, the basic ingredient of chewing gum.

Planting corn. The farmer lays off furrows with wooden plow, drops by hand, covers with foot.

Besides encouraging diversification of crops, the Salvadoran Government has undertaken to help the farmer by giving technical advice and financial assistance particularly through the mortgage bank, which finances coffee and cotton crops. It also extends loans on sugar, cereals, salt, and other products. Erosion control is another activity in which the Government has taken a keen interest. In addition to official activities, private initiative is also very active in providing agricultural credit. During the last four years, 12 associations have joined a national cooperative. In February 1941, a cotton growers' cooperative was formed, and a recent law obliges all cotton producers to join it.

Though agriculture plays such an important role in

Coatepeque Lake. This crater lake is a famous resort high in the mountains.

Courtesy of the Legation of El Salvador

Open air fruit stand, with watermelons, papayas, sapotes, mangoes, cashews.

the life of El Salvador, it is by no means the only source of national wealth. Mining and manufacturing activities both contribute to the country's income. Gold, silver, lead, and mercury are some of the mineral products which come out of El Salvador's rocks. These riches have never been fully exploited.

As for the manufactures, they too are still in the stage of development, and they are laregly based on El Salvador's products of the land. Coffee processing, cotton spinning, flour milling, sugar refining, the making of fiber bags for coffee and sugar, and alcohol manufacture are some examples. The tortoise of the hawksbill species makes its home in Salvadoran waters, and from it the people produce such useful items as combs, trays, and brooches. Leather goods, soap, beer, hammocks, cigarettes, some fine silks, and even iron tools and implements are made in El Salvador. There is also a vegetable oil industry. Clothes, hats, and shoes are made for local consumption. Foreign-made goods also enjoy a ready market.

El Salvador's transportation system is an example of the triumph of human industry over the tropic's natural barriers. A 65-mile railroad connects the port of Acajutla with San Salvador, the capital, while a paved highway stretches between La Libertad and the capital.

El Salvador takes pride in pointing out that it was the first republic between Panama and the United States to complete its part of the Pan American highway. In the main, the Government, which has an income of about $8,500,000 a year, has paid for its own roads without resorting to loans. Only for the completion of its sector of the Pan American highway did it borrow the sum of $1,196,000 in the United States. It has also contracted an obligation amounting to $1,000,000 for other military purposes.

Educational facilities are a constant source of pride. Primary schools—at which attendance is compulsory—number 850. This includes over 100 evening schools for adults. Secondary education is also provided, and the national university imparts advanced training in medicine, dentistry, chemistry, pharmacy, engineering, law, and the social sciences. There is a normal college, for teachers. A number of technical schools give specialized training. A semi-official organization, *La Unión Agrícola*, gives agricultural courses.

Social welfare is a matter of active concern to the Government. Swimming pools, small amusement parks, and other recreational facilities are on the increase in the cities. For the rural dweller, there is an expanding program of land distribution. A growing middle class bids fair to take an ever more important part in the life of the country.

El Salvador has cooperated with the United States most faithfully. In June 1940, it passed a law forbidding propaganda against the principles of democracy. In cooperation with the United States, too, it has undertaken to establish an experimental station calculated to give significant training to farm people and to help promote a well-rounded inter-American economy. Although El Salvador is feeling definite shortages in certain imported items necessary to its economic existence because of the present lack of adequate transportation facilities by sea, it is hoped that the country may overcome an appreciable portion of these difficulties through other means of transportation and through greater diversification of its own agricultural production.

Already an effective unit in the promotion of inter-American understanding, this nation of active and adaptable people gives promise of ever greater achievements in cooperative living.

Courtesy of the Legation of El Salvador

Designated the national tree in 1939, the Macuilishuat is planted extensively in El Salvador, where its pinkish flowers in large clusters brighten parks and roads. The lumber is used for furniture, and liquid obtained from boiling the bark has various medicinal uses.

The Future of the Forests

After the war the countries of North, Central, and South America may have the opportunity to develop a large export trade in lumber. To satisfy these foreign markets as well as expanding local demands, development of the forest should be planned to yield a sustained output.

by C. L. FORSLING

War consumes wood in large quantities and innumerable forms.

Primitive men fought with wooden clubs, bows and arrows, and spears. Wooden battering rams, catapults, and ballistae were the ancient forerunners of artillery, as wooden chariots were the earliest ancestors of our present-day jeeps, and wooden triremes of modern warships. Stockades of wood have served as defensive works down to modern times. Almost everyone has read of the stratagem of the wooden horse, by means of which the Greeks penetrated the defenses of Troy. Every schoolboy or schoolgirl who has struggled through high-school Latin remembers how Julius Caesar built a wooden bridge across the Rhine during his campaign against the Germanic tribes.

Modern war, in spite of its high degree of mechanization and its dependence on steel, copper, petroleum, and all sorts of minerals, also requires wood in more ways and in larger quantities than any wars of the past. Considering the millions of men under arms, merely to enumerate some of the things for which wood and other forest products are required, is enough to show the present importance of wood. Lumber consumption in the United States has increased some 40 percent since the beginning of the war.

Wooden buildings house most of the armed forces and their equipment. Great quantities of wood are used in the construction of war factories and in housing thousands of workers, employed in them. Wooden boxes and containers made from the paperboard derived from wood, are used to store and ship food, munitions, and equipment. Many ships are made of wood, and much timber is required for shipways, wharves, piers, pontoons, and bridges. Wood supplements other material in military aircraft and in many types of vehicles. Balsa and cork are essential for such diverse uses as life preservers, life rafts, and insulation. Derivatives of wood are used in explosives. Charcoal from wood is an essential component of gas masks. Pine turpentine and rosin, oils and resins from tropical trees, tannin from various barks, woods and fruits of trees, and paper, rayon, and plastics made from wood meet many military needs. The rubber on which modern warfare largely depends was originally a product of Western Hemisphere forests and is still supplied in moderate quantity from that source. And not only does the war machine consume wood directly and indirectly; it tends to shift consumption for ordinary civilian purposes from metals to wood.

In Canada and the United States there has already been some curtailment of ordinary civilian consumption of wood. There will be more. Although such important export markets as China, Japan, and the European continent have been lost for the duration of the war, direct and indirect military requirements, and, in the case of Canada, increased shipments to Great Britain have more than compensated for these reductions in demand. The drain on the North American forests remains at a

Photo by Seibert, Rubber Invest., B. P. I

Cedro or Spanish cedar, in the Atrato Valley, Colombia. The wood of this cedar is used in most countries of Tropical America for general construction, furniture, and interior finish.

high level, and even tends to become greater than before so far as the better and more accessible supplies of timber are concerned. Even the forests of Alaska are being called upon to supply timber for war uses.

The impact of the war on the forests of Europe has been far more severe. During the last 20 years more efficient methods of using wood have been devised, and many new uses have been discovered. As a result of these developments, and stimulated by war needs and shortages of other materials, most countries on the European continent have been increasing their wood consumption. Not only is wood being more widely used for construction and as fuel, but it is being employed in considerable quantities for such products as motor fuel, stock food, textiles, munitions, and plastics.

Germany, with forests in normal times inadequate for its own requirements, has been overcutting them heavily since 1934. Whatever the outcome of the war, production from German forests will have to be greatly reduced for a considerable period in order to rebuild the growing stock. France, Spain, Italy, the Netherlands, Belgium, Denmark, and Greece have not sufficient forest resources to meet their normal needs. Ordinarily, Great Britain imports more than 90 percent of the wood used. Since imports of timber have been hampered by the war, practically all of these countries have been cutting far in excess of the sustained-yield capacity of their own forests. Even neutral Switzerland is cutting twice the normal amount during the current year.

The countries of east-central Europe, from the Baltic States to the Balkans, have exported large quantities of timber since World War I, and in overcutting their forests, they have reduced their capacity for supplying timber in the future. Sweden, Finland, and northern Russia—the only European countries with a significant surplus of timber that is available for export—have supplied a large part of the deficits of the rest of Europe. Only a little more than 10 percent, or about one billion board feet a year, came from North America in recent years.

Photo by Stadelman, Rubber Invest. B. P. I

Mahogany logs, La Ceiba, Honduras.

Despite the loss of most of its western European markets, Sweden continues to export timber to central Europe and has increased its own consumption. The drain on the forests of the country has not decreased sufficiently to allow any important accumulation of surplus growing stock in its forests. For this reason, it is hardly likely that Sweden will supply much more timber after the war than before.

In addition to the widespread overcutting to meet consumption requirements, large areas of forest are destroyed or seriously damaged by military operations. Not only are mills and equipment destroyed, but great quantities of timber are cut, burned, and wrecked by artillery, bombs, and tanks.

Such inroads into the timber capital of most European countries will inevitably result in reduced productivity for a long period after the war. On the other hand, these countries are likely to need unusually large quantities of wood to repair the ravages of war and to reestablish a peace-time economy.

There is reason to believe that the post-war demand for wood will be large, not only in Europe, but all over the world. In combat areas and areas subjected to air raids, the first and most urgent need will be for construction and repair of dwellings, factories, and other buildings. Timber will also be needed for repair and new construction of railroads, bridges, and port facilities. Outside the war zones, there will be a reservoir of unsatisfied needs for wood construction that would have been built had the war not intervened to curtail construction. There will be a large accumulated demand for wooden products as well.

Even in the United States the consumption of wood may well be expected to be larger than it was during a decade before the war. Millions of people are still inadequately housed. Many farms lack essential buildings. The post-war period should see a fuller utilization of national productive capacity than before the war, and a wider distribution of the resulting purchasing power which can result in higher standards of living.

In the other Western Hemisphere countries, an even greater relative increase in wood consumption may be expected. Development of natural resources will be accompanied by construction of highways, railroads, airports, and shipping facilities at coast ports and on inland waterways. Many new industries are likely to grow up, to manufacture goods from native materials. In all countries, growth of industries has brought greater consumption of wood, whether used directly as raw materials or as a result of the enhanced buying power of persons employed in industry.

In recent years the forests of the Western Hemisphere have supplied 40 to 50 percent of the timber used in the world, for all purposes. They have supplied 50 to 60 percent of all timber other than firewood. Excepting firewood, the Western Hemisphere countries, in the aggregate, have also consumed more timber than the rest of the world. Most of this timber, it is true, they used at home; less than 5 percent was exported to the Eastern Hemisphere.

Of the total Western Hemisphere production, 95 to 97 percent was cut in the United States and Canada, which have only about 2 million square miles of forest land—37 percent of that in the Western Hemisphere. The countries south of the Río Grande, with 63 percent of the forest land, produced only 3 to 5 percent of the timber. The timber consumption of most of them was—and is—very small in comparison with the consumption of their northern neighbors. Although the northern countries use possibly two to three times as much wood for fuel (including charcoal) per capita, they use 20 to 30 times as much other timber.

Despite the large area of forest land and the low rate of timber consumption, the southern countries have depended on the United States and Canada, and to a minor extent on northern and eastern Europe, for part of the timber that they used. There are several reasons for this turn to a foreign supply. The Europeans who settled in South and Central America and the West Indies were accustomed to pine, spruce, and similar softwood construction timbers that grow in only a few places in the tropics. The local forests were composed of a great diversity of tree species, mostly hardwoods, many of them difficult to work or season, and generally unknown as to physical properties. There were a few exceptions, of course, like mahogany and Spanish cedar. The cost of getting out local timber was high in most places because of the character of the forests and the small demand, which made large-scale operations impractical. Supplies of northern softwoods were abundant and could be delivered cheaply by water to the coastal areas where the cities and industries of the southern countries were so largely concentrated.

Excepting a limited volume of trade among themselves—especially exports from Brazil and Chile to neighboring countries and occasional exports from northern Mexico to the United States—the southern countries have exported very little timber for ordinary construction purposes. Their timber exports have consisted mainly of so-called "precious" woods or fine cabinet woods, and other woods for special uses, such as dyewoods and tannin-yielding woods. These bring high prices and therefore can be marketed overseas despite high costs of extraction and transportation.

At least for some time after the war it may well be necessary to import seven to ten billion board feet a year from other continents to meet the needs of Europe alone. While equatorial Africa and West Africa can supply some of this timber, and small quantities may be brought from southeastern Asia and the East Indies, the Western Hemisphere will have to supply the major portion. Canada and the United States can supply a part of it, but due to the heavy exploitation of the past, their forests are not in a condition for an increased cutting much beyond local needs, plus the approximately three to five billion feet a year normally exported to other

Photo by U. S. Forest Service

Loading mahogany logs in British Honduras.

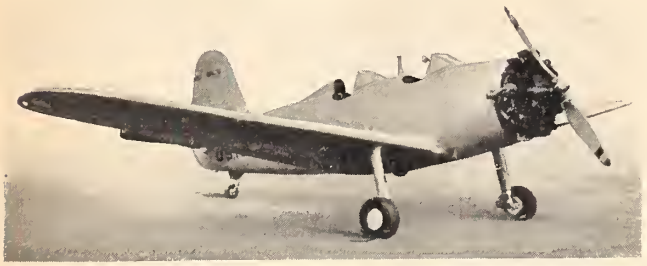
countries. Not all of this three to five billion feet has been going to Europe. It was shared by eastern Asia, Australia, New Zealand, and Latin America; some of these regions will be in the market for timber after the war. If the North American forests could be brought to a state of full productivity, with the proper distribution of age classes, there would be a fairly large surplus for export, but such a condition cannot be obtained for many years. If the forests are overcut for any considerable period to meet post-war demands, the attainment of full productivity will be greatly hindered or rendered impossible.

Meanwhile, the United States—and probably Canada—will find it difficult to supply their own requirements for the better grades of hardwood lumber. The plywood industry, still in its infancy, will require many times as much wood as it has up to now. The supply of high-grade hardwoods that has been used for these purposes—oak, walnut, ash, yellow poplar, hickory, birch, maple—for some time to come will be inadequate to meet a growing demand.

It seems reasonable to expect, therefore, that the countries of South and Central America may have the opportunity, after the war, to develop a large export trade in timber—both special-purpose woods and timber for construction and general uses. Many of these countries have abundant supplies of suitable timber, even though large areas of the most accessible forests have been destroyed. But, obviously, general-purpose

timber cannot be sold at as high prices as the precious and special woods hitherto exported.

Conversely, a fairly large and continuous demand should make it possible to produce timber from the tropical forests at considerably lower cost than in the past. Only then can logging and milling enterprises be organized with modern equipment, efficient transportation lines, and low unit costs. The new demand will have to embrace the kinds of timber that make up the bulk of the stand instead of only a few scarce kinds, like mahogany, for example. Large areas have to be worked over to maintain continuous operations, and much time is required for hunting out the trees to be cut and for laying out logging plans. Overhead costs of constructing and maintaining forest transportation systems—truck trails, roads, logging railroads, or improved waterways—become excessive. But if the bulk of the species of timber in a stand can be taken, the cost per mile of transportation system can be spread over a much larger volume of timber and over a longer period of operation.



Official U. S. Navy Photograph

New plastic plywood plane being tested by the United States Navy.

Long distance from forest to consumer will not in itself result in prohibitory costs for the better grades of timber for ordinary uses. Common grades of North American softwoods are shipped many thousands of miles to almost all parts of the world. Timber from South and Central American forests can also take an important place in world markets, provided it can be extracted economically and marketed systematically. Brazil already exports Paraná pine lumber to Europe and Africa.

Certain steps can be taken to establish and enlarge the markets for tropical timbers, particularly those that are not now widely utilized. As most of the woods occur in more than one country, international cooperation in all of these matters is highly desirable. To facilitate marketing the woods, it will be helpful to standardize names, grades, and methods of measurement of the various kinds of logs, timbers, and sawed lumber. A well planned and well financed campaign of advertising will also be helpful. To assure regular supplies for the world market, it is important that exploitation be planned so as to yield a sustained output. A well organized, centralized marketing agency in each country, under governmental control, could contribute much toward developing and holding markets in foreign countries.

Although there should be opportunity after the war for a greater export trade in forest products, still more important is the supply of local needs. Plans should provide insofar as practicable to meet these future needs of each country from its own forests. Before embarking on a comprehensive program of increased forest exploitation, it is to be hoped that each country will formulate and follow consistently a policy of conservation and management that will prevent waste and destruction of its forest resource. The forest is an essential part of the national heritage, to be managed in perpetuity for the benefit of all the people, and no individual or group of individuals, no matter what the legal title to the land, may deprive the present or future generations of the benefits that the forest brings.

A first step in formulating a permanent forestry policy is a comprehensive survey of the forest resources, in order to ascertain their extent, location, composition, and productive capacity. Another needed step is to plan for systematic utilization, in harmony with the silvicultural requirements of each type of forest, to the end that forest land will be maintained as continuously productive forest, unless it is suitable and needed for cultivation or other use.

The United States is finding that the establishment of permanent forest enterprises where forest and farm land are intermingled, should go hand in hand with a permanent agricultural development. From the standpoint both of efficient forest operation and of the social welfare of the people concerned, a settled forest worker population tied in to an agricultural development is most satisfactory. With careful planning, only the good agricultural soils will be cleared for crops and those that are better suited for trees will remain in forest. Also, land that has been cleared and found unsuited to agriculture should be restored to forest. The forest will protect the crop land, conserve water and soil, and supply wood and timber for use on farms and in the towns. The needs of the farmers and of the numerous small industries that will spring up will provide a market for large quantities of common and low-grade timber that cannot be exported. The farmers will supply most of the food required by workers in the forests and the communities built around forest-products industries. Many forest workers, especially where work is seasonal, can then be drawn from the farm population, to the mutual advantage of both. Where such a program is followed, forestry and agriculture together become the foundation of a permanent and increasingly prosperous national economy.

ALONG THE *Agricultural Front*

▲ Chilean Congresses and Expositions

First conference of retailers. The Retailers' Chamber of Commerce of Chile organized a conference which was held in Santiago from October 14 to 16, inclusive. According to the press, the principal subjects of discussion were the high cost of foodstuffs and of consumer goods.

First engineering congress. A congress of engineers was organized in connection with the celebration of the one hundredth anniversary of the University of Chile. Devoted particularly to engineering in the public works aspect, this conference took place between November 6 and 14; the United States was invited to participate through the Office of the Coordinator of Inter-American Affairs.

In conjunction with the conference, a National Engineering Exposition, designed to present the history of public works in Chile, opened on November 7.

The Chilean Military Geographical Institute also took an active part in both the conference and the exposition. Of particular note were its interesting studies on map making in Chile.

Annual livestock show. The annual livestock show organized by the Sociedad Nacional de Agricultura opened on October 13 and closed on October 18. In addition to livestock, agricultural machinery and some commercial feeds and fertilizers were exhibited.

Since the organization of the Development Corporation some of the most important entries have been pure bred cattle imported from the United States for breeding purposes. The Corporation grants three-year credits at 5 percent interest to buyers of this pedigreed breeding stock, which is auctioned off during the exposition.

Concepción livestock show. A large livestock and poultry show was held in the southern city of Concepción between October 22 and 25.

▲ Industrial Exposition in Venezuela

In commemoration of the first centenary of the transferal to Caracas of the remains of Venezuela's national hero, Simón Bolívar, great industrial and agricultural expositions have been scheduled to be held in the capital city from December 17, 1942 to January 16, 1943. Completely combined to all intents and purposes, the two expositions were designed by the Government to furnish a unified demonstration of what Venezuela had been able to accomplish during the past years in all fields of production and development. All manufactured articles were to be exhibited by the Industrial Exposition, and all raw materials, as well as everything connected with agriculture and cattle-raising, by the Agricultural Exposition. The Ministries of Development and of Agriculture and Animal Husbandry were placed in charge.

All Venezuelan industrialists were invited to participate in the country's first Industrial Exposition. A questionnaire sent to all prospective exhibitors carried request for information about capital, monthly turnover, articles produced, average monthly production, capacity, principal markets, annual volume of exports, raw materials used (where obtained and from whom), number of employees and nationality of same, protection received from the Government, conveniences or inconveniences derived from the present world situation, outlook and future plans. The main purpose of this questionnaire was to secure information in regard to the industrial capacity of Venezuela and the development of domestic industry during the past years; to discover the possibilities of securing raw materials in the country to supplant those now being imported; to encourage industries not represented in the Exposition and liable to being profitably exploited; to eliminate, if possible, those that are not considered beneficial to the industrialists themselves or to the country.

The Exposition was scheduled to be held in the large modern building occupied by the National Teachers' College (Instituto Pedagógico Nacional), opposite the National Hippodrome, and in the adjacent Students' Stadium (Estadio Escolar). The Institute was to provide space free of charge for the exhibits of all those small industrialists unable to construct individual pavilions; larger industrialists were to contribute to the exposition economically, and the proceeds would then be applied to cover the expenses of the poorer exhibitors. Space sold in the Stadium was to be used for the construction of individual pavilions. A list of exhibitors who signed contracts for the installation of pavilions included petroleum companies, breweries, manufacturers of paper, cement, pharmaceuticals, construction materials, glass, food products, wooden houses, liquors, and many other items.

In connection with the Exposition, the Agricultural Fair was scheduled to be held at the National Hippodrome, which is opposite the building occupied by the Exposition and connected to it by a bridge. Small pavilions were to be installed, where manufacturers were to have an opportunity to sell their products. A special department at the Exposition would take care of all orders received.

Among the many attractions planned for the Exposition were the exhibition of a tribe of Indians actually making rugs, pottery, and other household items; the quadruplets of Barquisimeto; several daily shows by native artists given in the auditorium of the Institute; and appropriate films.

Serving to acquaint the public with the goods now produced in the country and to enhance the slogan which President Medina himself set for the Exposition—"Consume what Venezuelans produce and produce what Venezuelans consume," the Exposition and Fair should present the principal aspects of the national economy to the Venezuelan public.

▲ Chile's Unique Botanical Collection

An extremely valuable and scientifically unique collection of specimens of Chilean plants, now housed in the Chilean Museum of Natural History at Santiago, will be properly classified and mounted, if funds can be found to carry out a project which is being sponsored by the Department of Genetics of the Chilean Ministry of Agriculture in collaboration with Dr. T. Harper Goodspeed, noted American botanist and Director of the California Botanical Gardens.

The importance of the plant preservation project for the advancement of inter-American agriculture has been outlined by Dr. Carlos Muñoz Pizarro (Curator of the Herbarium), Dr. Manuel Elgueta Guerín (Director of Genetics of the Chilean Ministry of Agriculture), and by Dr. Goodspeed, as follows: (1) Inevitable national significance will attach to the proper preservation of one of Chile's most important scientific collections. (2) For the first time the original sources of information concerning Chile's great variety of plants will be readily available for study by local and international scientists interested in the exploitation of Chile's plant resources and the development of plant breeding in other parts of the world. (3) Great encouragement will be given to the development of modern Chilean botany, a development which will not only have international scientific significance, but should also lead to discoveries of practical importance among plants of agricultural interest. (4) It is a recognized practice for the botanists of one country to borrow from the museums of other countries the plant specimens which are important in their research work. The present unmounted condition of the plants in the important Chilean collections has made it impossible for the Chilean Museum of Natural History to engage in such international exchanges.

Most of the plant specimens now in the Chilean Museum of Natural History were collected by early botanical explorers in Chile. Among those most widely known by botanists were Carlos José Bertero (collected during 1825–30); Claudio Gay (collected during 1835–45); Rudolph Amandus Philippi (1850–1900), W. Lechler (about 1850); Carl Rahmer (about 1870); Christian Ludwig Landbeck (1875); Frederico Philippi (1880 – 1906); and Karl Reiche (1880–1911).

The collections of Claudio Gay and R. A. Philippi, with the specimens labelled according to the names given the plants by these two pioneers in Chilean botany, represent the original sources of information about the Chilean flora. If those plants and their labels are not properly preserved, the best recognized, most complete collection of Chilean plants in the world will have been lost to botanists and to scientific agriculture in general.

At the present time the rare plant specimens are preserved loose, in folded sheets of old paper and filed in a large number of miscellaneous folders and packages. The packages are housed in temporarily adequate and well-built wooden cases. Sufficient space has been provided in the Museum for these cases and for the scientific staff, as well as room for visiting botanists who wish to examine the collections. The present condition of many of the old, brittle, dried specimens, loose in their paper covers, is deplorable. Every time they are taken out for examination, their condition naturally becomes worse. In addition, the labels on which were written the original names given to the plants by their discoverers are in great danger of becoming detached from the corresponding specimens. Once detached, the specimens will, in many cases, become entirely valueless.

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AGRICULTURE IN THE AMERICAS MADALINE W. NICHOLS, EDITOR

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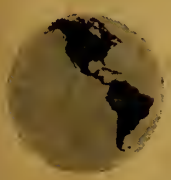
Julián R. Cáceres

OUR MUTUAL FRIEND



"Honduras" means "The depths." The name comes from the deep water which Columbus found off the northern coast when he sailed its shores in 1502 and landed to annex the land for his king.

Honduras is the third largest republic in Central America. Its capital is Tegucigalpa, which takes its name from the Indian words for "Silver hills." For Honduras is a land rich in silver.

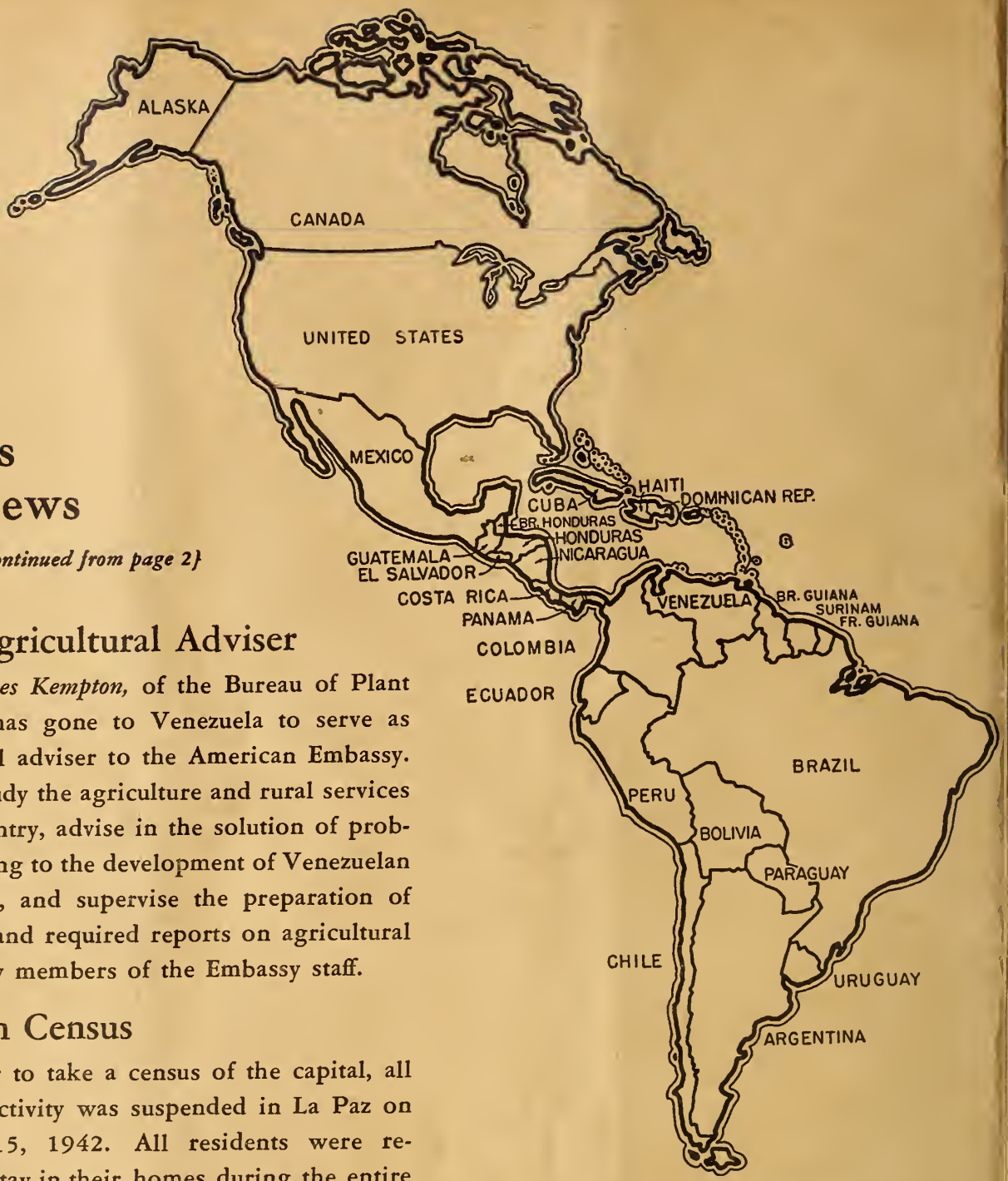
On July 18, 1939, Dr. Julián R. Cáceres presented to President Roosevelt his letters of credence as Envoy Extraordinary and Minister Plenipotentiary of Honduras. An ardent admirer of the United States, Dr. Cáceres had worked unceasingly to strengthen the relations between Honduras and the United States since his appointment in 1933 as First Secretary of the Honduran Legation in Washington. Since that date he has also served several times as Chargé d'Affaires, the position he held at the time of his appointment as Minister.

Dr. Cáceres was born at Comayagua, one time capital of Honduras, on October 6, 1892. There he completed his early education, to be followed by the study of sciences and letters in the neighboring republic of El Salvador and by work at the Central University of Tegucigalpa from which he obtained his degree in political and social science. In 1920 the Supreme Court accepted him as a member of the Honduran bar, and for some years he practiced law at San Pedro Sula.

In the course of his distinguished political career Dr. Cáceres has served his country as a member of the staff of the Ministry for Foreign Affairs, as a member of the Chamber of Deputies, and as the governor of several of the departments into which the Republic of Honduras is divided. In 1928 he represented his country at the boundary negotiations between Honduras and Guatemala. He was a delegate to the Third Caribbean Inter-American Conference, to the Eighth American Scientific Congress, and to the Third Conference of the Ministers of Foreign Affairs of the American Republics; he was also a member of the Inter-American Financial and Economic Advisory Committee. A well-known writer on social and political subjects, Dr. Cáceres is a member of numerous learned societies in Honduras. He is the representative of Honduras on the Governing Board of the Pan American Union.

Names and News

{Continued from page 2}



New Agricultural Adviser

Mr. James Kempton, of the Bureau of Plant Industry, has gone to Venezuela to serve as agricultural adviser to the American Embassy. He will study the agriculture and rural services of the country, advise in the solution of problems relating to the development of Venezuelan agriculture, and supervise the preparation of voluntary and required reports on agricultural subjects by members of the Embassy staff.

Bolivian Census

In order to take a census of the capital, all business activity was suspended in La Paz on October 15, 1942. All residents were required to stay in their homes during the entire day while the census takers counted 287,097 persons. With an estimated floating population of 5 percent, the figure for the total number of inhabitants of La Paz was fixed at 301,450.

Distinguished Visitor

Dr. Arnando Dugand, Director of the Instituto de Ciencias de Colombia, has returned to Colombia after a three months' visit in the United States where he studied botanical collections in Washington, New York, and Boston. Dr. Dugand, an authority on palms and figs, is editor of *Caldasia,* a leading botanical journal.

U. S. GOVERNMENT PRINTING OFFICE: 1943

Agriculture in the Americas

Issued Monthly by the OFFICE OF FOREIGN AGRICULTURAL RELATIONS
UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

February 1943

Cooperation in the Americas

The project of the United States Department of Agriculture to encourage the production of rubber in the Western Hemisphere is progressing very favorably. The big accomplishment is the distribution of seed. For the first time in our program, there is almost more seed than can be used immediately. Large supplies are being obtained in Mexico, large supplies were distributed from Costa Rica and the Canal Zone, and large supplies were received from Liberia.

The outstanding accomplishments in the program have been possible only because of the wholehearted support and cooperation of many organizations, public and private. From the very first the responsible officials of the Army have recognized the value of this plantation development in the Western Hemisphere and have supplied transport planes to bring seeds first from Brazil, and more lately from Liberia; they have also taken seed from Costa Rica to South America and from Mexico to Central and South America. The large distribution of seeds this year could not have been made without this cooperation. War agencies of the Government in Washington have facilitated the purchase and transport of supplies to the Department's research centers in Latin America.

Private agencies also have cooperated wholeheartedly. Among the more outstanding contributions of American agencies are those of the *Goodyear Tire and Rubber Company*, which has given unstintedly of the experience and technique of its technologists; the *Firestone Tire and Rubber Company,* which furnished seeds of high-yielding clones in Africa; the *United Fruit Company* and the *Standard Fruit Company,* which have facilitated the work by the cooperation of their local managers throughout the Latin American countries; *The Rubber Age,* which combined with *Mr. Frederick Marchiona,* the author of "Latex and Its Industrial Application," and furnished 19 three-volume sets of this publication gratis to our direct cooperators in Latin America.

The direct contribution of cooperating countries in Latin America is also important. The Government of Brazil made appreciable appropriations for rubber investigations and rubber plantings, and placed *Dr. Felisberto Camargo* in charge. Colombia, Mexico, Nicaragua, and Peru all sent representatives to the Central Experiment Station in Costa Rica for training periods to learn the techniques of rubber production. Guatemala and Honduras sent representatives to the Lancetilla Experiment Station at Tela. This is to mention but a few of the Latin American countries that are cooperating fully and enthusiastically in the promotion of rubber planting in the Western Hemisphere.

Zoological Experiment Station

According to *Manuel Casanueva,* Director General of Agriculture, and *Dr. Alvaro Blanco,* Director of the Department of Animal Husbandry of the Ministry of Agriculture, Chile's first zoological experiment station is to be established for the purpose of improving the livestock and increasing livestock production in Chile. It will also serve as a laboratory for research.

The new station will be located at Purranque, in south-central Chile, where it can serve the important livestock-producing provinces of Cautín, Valdivia, Osorno, and Llanquihue.

Agriculture IN THE *Americas*

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Insect Commandos

By air mail and air express small numbers of beneficial insects today speed on their missions of crop protection. As the natural enemies of other destructive insects, they have been recruited to reduce those agricultural pests to a non-injurious level.

Rodolia cardinales. A pioneer from Australia.

by C. P. CLAUSEN

Slightly more than 50 years ago, the Vedalia beetle was imported from Australia to combat the destructive cottony cushion scale in California. The beetle was spectacularly successful in its work. Since then this method of control has been increasingly applied, and today insect commandos are being speeded by airplane from country to country to destroy their insect victims. The technical name for such a method of control is biological control. Supplementing chemical and mechanical methods of control, it is now recognized as one of the most promising lines of approach to control of an insect pest. A review of the work that has already been accomplished reveals that at least 25 insect pests of agricultural crops have been fully controlled in one or more countries by this means. Partial control has been obtained with many others.

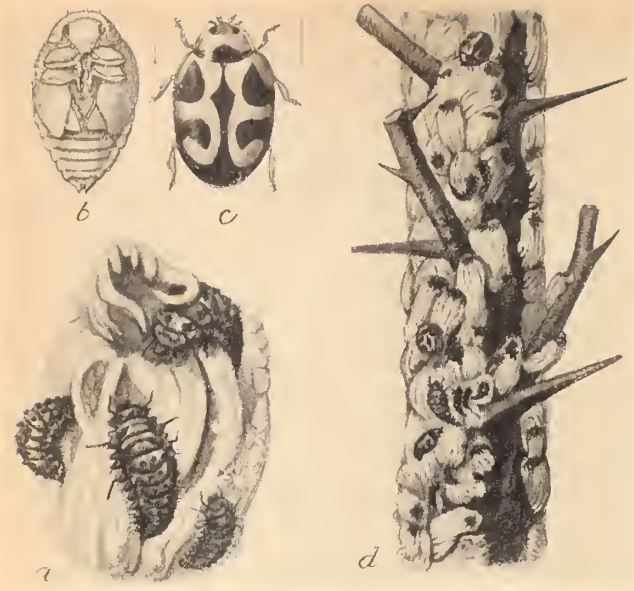
Control of insect pests by the biological method has one outstanding advantage over other means of control. The initial cost, represented by importation and colonization of the parasites and predators, is usually the only cost, and no further expenditures are necessary after the natural enemies have become generally distributed. Spraying, fumigation, and other methods of chemical, mechanical and cultural control, on the contrary, need to be repeated year after year and often several times each year, and they consequently constitute a continuous expense so long as the crop is grown.

But biological control has its limitations. It will be fully successful against only a relatively small portion of the pests of any region; it may be totally ineffective in many others. In general, it may be said that this method of control cannot be applied successfully against native insect pests which are already subject to attack by a full series of parasites and predators.

The situation with respect to pests of foreign origin is markedly different, and these species constitute a large majority of the most important insect pests of agricultural crops in the countries of the New World, where many of the crops themselves have been introduced from other countries. These pests gain entry into the country through various trade channels, as on nursery stock, in soil about the roots of plants, in fruit, grain, and various plant products. Usually the immigrant insect has eluded its natural enemies by leaving them behind. As a result, it is able to increase without the natural checks that operate against it in its native home, and this is one of the main reasons why introduced pests are frequently so much more destructive in another region than in the country of their origin.

To control introduced pests, we must obtain their natural enemies from the country of origin of the pest. The degree of control accomplished by the natural enemies is usually not higher in the new country than in the country of origin; it may be much less. For example, climatic conditions can change the basic correlation between the life cycles of parasite and host and so destroy the effectiveness of control. We have no means of determining in advance how effective the introduced natural enemies of any pest may be in the new environment, and consequently it is advisable to introduce as many species as possible in the hope that there is one or more among them that is adaptable to the new conditions and able to bring the pest infestations under control.

Before discussing the possibilities of future biological control work in the Americas, it might be well to consider what has been accomplished in the past. None of the countries of Central or South America has as yet



Rodolia at work. (a) Larva feeding upon egg mass of cottony cushion scale. (b) Pupa. (c) Adult. (d) Infested twig, showing eggs, larvae, and beetles among scales.

undertaken a consistent study of biological control as a part of its program for the control of agricultural pests, yet virtually every country has employed this method in one or more instances. Most of this work has been done on a cooperative basis, the parasites or predators being obtained by request to the countries where the desired species are native or have been established from elsewhere.

Few realize the extent to which this exchange of beneficial insects has taken place in the past. Complete data are not available regarding the exchanges between the countries of Central and South America, but a note of the shipments made to these various countries by the United States Bureau of Entomology and Plant Quarantine and the California State organizations, aided in recent years by the Puerto Rico Agricultural Experiment Station of the United States Department of Agriculture, is indicative of the extent of past exchange. The list records the sending of 53 species of parasites and predators to 21 countries or colonies in Central and South America for the control of 23 different insect pests.

While complete information is not available regarding the final outcome in all cases, certain establishments are known to have been accomplished. For the citrus insects, natural enemies were successfully established for black scale in Peru (1936) and Chile (1933); for the citrophilus mealybug, in Chile (1936); for the citrus mealybug, in Puerto Rico (1911, '13); for the citrus blackfly, in Panama, Haiti, and the Bahamas (1931), in Costa Rica (1934); for the cottony cushion scale, in Guatemala (1897), Chile (1931, '33), the Bahamas (1924, '33–34), Cuba (1928), Peru (1932), Puerto Rico (1932–33), Venezuela (1941); and for the Mediterranean fruit fly, in Brazil (1937).

Among the deciduous fruit insects, natural enemies of the codling moth were successfully established in Peru (1936–37); the woolly apple aphid in Uruguay (1921), Chile and Peru (1922), Costa Rica (1933, '36), Colombia (1933); the San José scale in Uruguay (1922); the oriental fruit moth in Uruguay (1936, '38); the white peach scale in Argentina (1908), Uruguay (1912), Chile (1914), Brazil (1921), and Puerto Rico (1938).

Field crop insects which have been fought, though with varying degrees of success, are the sugarcane borer, the green bug, the sunflower seed moth, the pink bollworm, cane aphid, cotton scale, negro scale, and the horn fly.

This list records shipments only from the United States, Hawaii, and Puerto Rico.

Considering that each of these consignments consisted of a relatively small number of parasites or predators, and that they were subjected to various adverse conditions and delays en route, the number of instances in which establishment was accomplished is surprisingly large. A review of the final outcome of these establishments, in terms of actual pest control, reveals that marked benefits have resulted in numerous instances. The cottony cushion scale has been fully controlled in practically all countries in which *Rodolia* has been established, and the same is true of the citrus black fly by *Eretmocerus*. The woolly apple aphid and the white peach scale have been fully controlled by their respective parasites in some of the countries where the latter have been introduced.

In view of what has been accomplished in the past, the question arises as to the problems that require attention at the present time. Needless to say, steps should be taken immediately for the introduction of the natural enemies of the cottony cushion scale, citrus blackfly, woolly apple aphid, and white peach scale into all countries where these pests occur and where the enemies have not yet been established. In addition, the black scale and several species of mealybugs attacking citrus offer sufficiently good opportunities for substantial benefits to justify early attention. Still another insect pest presenting the greatest possibilities of results in actual control is the coconut scale. These problems are offered for first consideration for several reasons: (1) the natural enemies are known to be able to fully or partially control their hosts; (2) reliable methods of shipment have been developed, and (3) there is a reasonable chance of establishment of the natural enemies through the release of a single colony of adults. This latter is especially important inasmuch as many of the countries now interested in the subject of biological control of insect pests do not have specialists on their staffs who are trained in the handling of parasites and predators, and consequently they must

rely upon the direct release of the imported material rather than utilize a portion of it for building up a laboratory stock from which extended distribution might later be made.

In the intermediate class, from the point of view of definite results in biological control, are several major pests, most important of which are the sugarcane moth borer and the oriental fruit moth.

On the other hand, there is a rather extensive series of insect pests, some of which are of major importance, for which biological control appears to offer very little promise. Heading the list are the grasshoppers, several species of which are very destructive in North and South America. These are all native to the regions in which they now occur, and each one has a series of natural enemies that attack its different stages. These enemies may become very abundant toward the end of outbreak periods, but apparently they fill only a minor role in terminating these outbreaks. At the present time we have no evidence to indicate that natural enemies, either native or introduced, can be utilized successfully in control.

With the exception of the woolly aphid of apple, very little success has been achieved in the control of aphid pests. Most of the aphid species are able to develop and increase their numbers at a considerably lower temperature than the parasites and, as a consequence, they attain a destructive level in the spring before the parasites are able to attack them. However, if parasites are entirely lacking in any country, they should be introduced for the protection they give against infestations during the latter part of the growing season.

There seems little possibility of attaining any appreciable degree of control of the codling moth of apple in countries where the pest has recently become established and where the parasites do not now occur. Similarly, control of the purple scale and the California red scale do not seem to promise success by biological means, and the same is true of the fruit flies of the family Trypetidae, that attack citrus and deciduous fruits.

With the general availability of air transportation between all countries of the Americas the problem of shipping parasites and predators has been very greatly simplified. The time required in transit for even the longest shipments is now only about 5 days, so that in most cases it is possible to forward the adult insects, which can be released immediately upon arrival at destination. A recent modification of the international postal regulations permits the forwarding of pure colonies of beneficial insects by mail, so that now small parcels can be shipped by air mail as well as by air express.

But besides this movement of parasites and predators from North America to Central and South America, there is, as well, a movement of these beneficial insects from south to north. Entomologists of the United States Department of Agriculture and of the California Agricultural Experiment Station have searched many of the countries of South America for natural enemies that might be useful in the control of insect pests in the United States, and to expedite this work a field station of the Department was established in 1940 at Montevideo, Uruguay.

The benefits that have already been obtained from the exchange of beneficial insects between the Americas indicate the value of this type of work. Under war conditions, when conservation of food, fiber, and forage crops are of vital importance, full advantage should be taken of this method of control of pests of foreign origin, especially the full utilization of the parasites and predators that are known to be capable of quickly reducing the pest insects to a non-injurious level. A number of these can be obtained readily, and air transport is available for rapid shipment to the countries where their work is needed.

Citrus blackfly parasites sail on a mission to Cuba. The cages contain growing plants infested with blackfly to serve as a food supply, and the parasites develop normally as they travel.

Agricultural Extension in the Americas

Agricultural extension should not be considered by itself, but it should be an integral part of an expanding system of rural education and intimately related to agricultural investigation.

by RALPH H. ALLEE*

There is a basic pattern common to the agricultural extension services of the American Republics. The principles of agricultural practice are taught to young people in their rural schools, to operating farmers by many types of agricultural agents, and by radio and press to all who care to listen and to read.

Cuba has a single department of agricultural instruction and information. Its Division of Instruction operates six regional agricultural schools for professional training. As Agricultural Inspectors, 126 of the graduates of these schools serve in much the same way as our county agents; they collect crop statistics, distribute improved seed, and are available for consultation on all local agricultural problems. In addition, the Division of Instruction operates sections of home economics, of 5-C clubs (which correspond to our own 4-H clubs), of demonstration farms, of correspondence courses, and of traveling schools. The schools move from place to place conducting meetings on appropriate subjects, such as the use of fertilizers, livestock improvement, modern cultivation practices, and insect control.

Brazilian Agencies

Under the direction of its Ministry of Agriculture, Brazil has numerous capable governmental agencies to educate and assist rural people. Of particular interest are the local agents of the Development Section of the Ministry. Working to increase the production of food crops in a vital rubber area of the Amazon Valley, they raise quantities of improved upland rice seed and cassava cuttings for distribution to food planters, and in their experimental gardens they test the adaptability of new crops and work out applicable new rotations.

The Agricultural Extension Services of Haiti function through rural schools for the younger generation, with agricultural agents to aid their parents. A novel feature of the Haitian scene is the agricultural policeman. He is a resident farmer. In a sense he corresponds to our Triple A Committeeman, but he has police powers as well. It is his job to see that the export crops of Haiti are produced according to high standards so the country as a whole will not suffer if, for instance, a very low quality of export cocoa is gathered and prepared by certain individuals. It is his duty to see that coffee is not picked until the berries are red. If annual crops are to be sown in the mountains, terraces must be built. Intentional fires that burn leaves and brush in the forests will mean the arrest of the offender by the agricultural policeman.

A Puerto Rican 4-H project.

Functioning Democracy

Extension work in the United States has developed a reciprocal relationship between people and their institutions, which is the essence of functioning democracy. Nonpolitical in character, it grew out of Thomas Jefferson's philosophy of mass education; it functions on the demonstration principle. The work applies to the farm, the home, health, recreation, and all other essentials of rural civilization. It combines local responsibility with centralized assistance, utilizes local leadership, codifies practice upon a basis of science. It capitalizes upon the enthusiasm of young people in a program of building creative citizens through inviting their participation. As

* From an address by Mr. Allee before the Association of Land Grant Colleges, at Chicago, October 28, 1942.

Exhibits on home food production.

The inauguration of the Ana María Hernández de González 4-H Club House.

perhaps its most effective element, it provides a local interpreter aware both of local needs and the resources available for their satisfaction. The Extension Service assures its continuity and effectiveness by obtaining social approval, rather than political power. Probably more than any other institution in this country, it has built its program on the actual needs of rural peoples.

Part of a Whole

At the Second Inter-American Conference of Agriculture it was the consensus of opinion that agricultural extension should not be considered by itself, but that it should be an integral part of an expanding system of rural education and intimately related to agricultural investigation.

How may our own agricultural extension service in the United States assist in the general development of the broad program of rural education in the Hemisphere? In any cooperation with our neighbor Republics we must recognize that we are dealing with 20 sovereign countries, each with its own system of government, its own more or less distinctive culture, and with an understandably jealous regard for its independence. No collaboration is justified unless it is actually reciprocal in effect; the other American Republics have contributions which they can make to us and of which we should be gratefully aware. And while at present all our activities must relate to the war effort, those war activities should in turn be related to collaboration which may continue after the war.

Reading
ABOUT THE AMERICAS

The following books of agricultural interest have recently been received by *Agriculture in the Americas:*

Pima and Pápago Indian Agriculture, Edward F. Castetter *and* Willis H. Bell; xv, 245 pp., The University of New Mexico Press, Albuquerque, New Mexico, 1942. This first number of the University's Inter-American Studies presents a scholarly account of Indian agriculture in the Southwest. The 10 chapter headings are: The Pimans; Land, climate and vegetation; Early basis of Piman subsistence; Piman cultivated crops; Selection, development and ownership of land; Agricultural implements; Planting, irrigation and cultivation; Harvest, storage and seed selection; Cultivation and utilization of tobacco—A ceremonial crop; General ceremonial aspects of Piman agriculture. There are 6 pages of bibliography and an index.

Planeación del Crédito Ganadero (Livestock Credit Program), Moisés T. de la Peña; 291 pp., Banco Nacional de Crédito Agrícola, S. A., Mexico, 1938. This book describes the livestock industry in Mexico and suggests a livestock credit program. Among topics covered are pasturage, climatology, diseases, markets, as well as census figures on livestock population.

The European Possessions in the Caribbean Area, Raye R. Platt, John K. Wright, John C. Weaver, *and* Johnson E. Fairchild; 112 pp.. American Geographical Society, New York, 1941. A compilation of facts concerning their population, physical geography, resources, industries, trade, government, and strategic importance. Also included is a "Note on the Island Territories of Colombia and Venezuela." Included are a 6-page list of references, an index, and a map.

Refugee Settlement in the Dominican Republic; 410 pp., The Brookings Institution, Washington, D. C., 1942. An economic survey of the Dominican Republic, as well as a study of refugee settlement there. Among topics

treated are the history of the Republic, its people, physical geography, agricultural and industrial development, forest and soil conservation, transportation, trade, and finance. Among the Appendixes, the rainfall charts and the sections on lemon-grass oil and on industries based on raw materials, are of agricultural interest.

The Face of South America, John Lyon Rich; xvii, 299 pp., American Geographical Society, New York, 1942. A panorama of South America from the air. Believing that in a single flight over a region it is often possible to obtain a clearer impression of the significant features of terrain and of the way it is being used by the people dwelling upon it than by months of exploration on the ground, the author publishes some 300 selected photographs with sections of descriptive and interpretive text.

A Bibliography of Latin American Bibliographies, C. K. Jones; 311 pp., Government Printing Office, Washington, D. C., 2 ed., 1942. A new edition of one of the most valuable of the reference tools in the Latin American field. The bibliography, which was first published in 1922, is now greatly enlarged. Bibliographical items are frequently supplied with informative and evaluatory notes. The more than 3,000 items are arranged in a "General and miscellaneous" section and in sections on the several Latin American countries.

Foreign Agricultural Bulletin

The Agriculture of Colombia. Kathryn H. Wylie; 160 pp., Office of Foreign Agricultural Relations, United States Department of Agriculture, Washington, D. C., 1942. (Foreign Agriculture Bulletin Number 1.)

The present world-wide war has made the people of the Western Hemisphere acutely aware of the need for closer inter-American cooperation, economically as well as politically. The part agriculture must play in the development of such economic collaboration is evident when it is realized that some of the greatest deficiencies of the United States are agricultural and that the economies of most of our neighbors are largely agricultural. The vital importance of Colombia in the development of economic solidarity in the Western Hemisphere rests largely upon its agricultural possibilities. A general description and appraisal of the present and potential agricultural production of Colombia shows that it can produce almost any crop within its borders. The commercial value of its tropical and semitropical products, however, far surpasses that of its temperate-zone crops.

The report on the agriculture of Colombia contains general information on the soil, mineral, forest, and human resources of the country as background material for the study of the history and development of agriculture, production practices and policies, and the structure and present status of the agricultural industry. Coffee occupies the place of first importance in the economy of Colombia. It usually represents more than half the total value of all exports. Bananas were until the past few months the second most important agricultural export. The description of these industries includes a statement on methods of production and marketing, government and private aid, and foreign trade.

Discussion of staple food and fiber crops produced for domestic consumption includes corn, wheat, rice, sugar, beans, oil and fats, cotton, and fique. Domestic production of corn and beans is sufficient for local needs, but it is necessary to import wheat, rice, sugar, and cotton. Imported vegetable oils, particularly coconut oil, account for about 70 percent of total requirements. Prospects for production expanded to the point of self-sufficiency are particularly favorable for coconut oil, cacao, and sugar. Production of tobacco is almost sufficient to supply raw material for one of the important domestic industries, and cattle raising is important in many states, particularly along the Atlantic Coast and on the Sabana de Bogotá. Grazing areas occupy about 65 million acres or 23 percent of the total land area.

Transportation difficulties have hampered the movement of goods from one section of the country to another, resulting in uneconomic production in certain areas and preventing specialization of production in the most efficient producing zones. Travel by airplane is rapidly proving a solution to the problem of passenger transportation; and the extensive use of airplanes for freight hauls would foster the development of areas now inaccessible to markets and provide for a more economic utilization of producing regions.

The discussion of foreign trade reveals that exports from Colombia are largely agricultural, although petroleum has reached second place in value in recent years. Imports are varied, including a wide range of manufactured products. The United States is the principal supplier of Colombian imports as well as the most important market for its exports. Coffee is by far the most valuable United States import from Colombia, but other things such as divi divi, barbasco, and tonka beans are also important. Rich resources make Colombia a potential supplier of an even wider range of products, including rubber, manila hemp, copra, and pita fiber. Physical conditions are excellent for expanded production of these commodities, and markets could no doubt be widened for many of them. Expansion in the production of coffee and bananas, on the other hand, must wait more settled world conditions.

Colombia has the soil and climatic variety necessary to produce a great many of the tropical products which the United States needs, not only in the war emergency but for future development.

Copies of this bulletin are available for purchase from the Superintendent of Documents, Washington, D. C., for 20 cents each.

Tung Growing in Latin America

Present war conditions have interfered seriously with shipments of tung oil from China, the chief world supplier. As a result, the American nations are giving increased attention to the possibilities of producing tung in this hemisphere.

Cluster of tung blossoms.

by JULIA L. WOOSTER

The most important of the so-called drying oils—since the rate of its drying speed and the water resistance of its films are second to none—tung oil has increased greatly in commercial importance in recent years. At present it is used in the manufacture of many products indispensable to certain war material and equipment. In 1940, 90 to 95 percent of United States factory consumption of tung oil was used in the paint and varnish industry, especially in the manufacture of high grade varnishes. Other strategic uses are in the making of certain insulating compounds for electric generators, cables, and wire. Tung oil is an important ingredient of many types of brake linings and of gaskets for steam pipes, pumps, and engines. It is also used in the manufacture of linoleum and oilcloth, and for waterproofing fabrics.

In the past, tung oil has been supplied to the world almost entirely by China, the sole large producing and exporting country. Under present war conditions, increasing difficulties have attended exports from China and have currently resulted in an almost complete stoppage of shipments.

Tung in the Americas

Many parts of the world with requisite climatic conditions have been interested in creating domestic sources of supply. The United States began growing tung experimentally in 1905; 1940 census data showed that 2,304 farms had 12,671,344 trees covering roughly 200,000 acres. Of the total number of trees, 4,114,555 were of bearing age in that year. The producing area includes portions of the States of Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas.

The potentialities of the Americas as future producers were recognized at Mexico City in July 1942 when the Second Inter-American Conference of Agriculture recommended that tung oil: ". . . be introduced into all of the American countries having climate suitable for its economic development. . . ."

As a matter of fact experimentation with tung was undertaken in certain portions of Latin America as early as 1928. Ten years later when a report on the tung oil industry throughout the world was published by the International Institute of Agriculture, experiments were being carried on in Costa Rica, Cuba, Dominican Republic, Guatemala, Haiti, Honduras and Uruguay, in addition to Paraguay, Brazil, and Argentina.

The three last named are believed to be the only Latin American countries producing tung oil in sufficient quantity to be of any commercial importance at the present time. Tung nuts and oil appeared in Paraguayan foreign trade statistics for the first time in 1941. Brazil is expected to put a small amount of oil on the domestic market in 1942. Argentina began supplying its local market in 1935. Consumption has been limited to domestic production since Argentina's last import of tung oil in 1938.

Tung trees are often used for ornamental purposes. In full bloom, their blossoms are white or pinkish.

The true tung or China wood-oil tree is known by the botanical name *Aleurites fordii* Hemsl. and is indigenous to central and western China. A closely related species, *Aleurites montana* (Lour) Wils., is native to southeastern China and is, therefore, suited for growing in a warmer climate than *A. fordii*. It is reported not to bear as heavily as *A. fordii*, but the trees are much longer lived. The oil of both is so nearly identical that no distinction between them is made commercially. There are three other species in the genus *Aleurites*—*moluccana*, *cordata*, and *trisperma*. The oil of the first (a native of the Malay region) is not of as high a quality as that of *A. fordii* and due to its hard, bony seed coat, different extraction machinery would be required. *Aleurites cordata* is the Japanese wood-oil tree and is cultivated in southern Japan and Formosa; its oil differs from tung in certain important qualities. *Aleurites trisperma*, a native of the Philippines, is also a source of a desirable oil of the tung type.

A. fordii grows to a height of 30 feet or more and lives for 35 years or more. Handsome in appearance, the tree is often planted for only ornamental purposes. In the spring, numerous clusters of snow-white or pinkish flowers appear and are followed by broad, dark green leaves. The flower cluster is made up of one or more female blossoms surrounded by a number of male blossoms. Depending on the number of female flowers in a cluster, two types of trees are distinguishable. If there are but one or two female flowers in a cluster, the tree is a single type, and only one fruit is produced on a shoot; if there are more than two, the tree is known as the cluster type and produces a cluster of fruit to a shoot. The trees usually begin to bear fruit about the third year and should be in full bearing by the sixth or seventh year.

Cross section of a tung fruit.

The fruit is similar to a small tomato in shape and is from 2 to 3 inches in diameter, though shape and size may differ sharply among the fruit from different trees. Its dark olive green color turns to deep brown as the fruit matures. Each fruit consists of an outer husk containing from 3 to 7—usually 5—seeds or nuts. Externally, these resemble a castor bean in shape and their brown coloring. The nut consists of a hard bony shell surrounding the kernel, which is white and very oily. When the fruit ripens, it falls to the ground, and harvesting consists simply in gathering the fallen fruit within a few weeks. Air drying to remove most of the moisture from the fruit is necessary before milling. In milling the fruit the nuts are removed from the woody hull, a portion of the shell is also removed, and the kernel and the remaining shell are ground into a meal. This is then heated and put through an expeller to express the oil. On the average, the oil expressed is about 320 pounds per ton of air-dried whole fruit, but this yield will vary depending on the variety and the degree of filling of the nuts.

Production in Paraguay

Government and trade sources in Paraguay have not made public any accurate up-to-date information on the acreage and production of tung trees there, although the country has been experimenting with tung production since 1928. Paraguay undoubtedly has suitable soil and the necessary rainfall, but some doubt exists as to whether it possesses a climate which will allow the plant to have a sufficiently long dormant period. Two out of eight crops are reported to have been lost in recent years for just this reason. With additional scientific investigations this difficulty may be overcome, however, and on June 25, 1940, the Paraguayan Government decreed that as soon as the National School of Agriculture was established at its new location in San Lorenzo del Campo Grande, a tung experiment station was to be created and annexed to the school. Best results from tung growing in Paraguay are anticipated in the central and eastern regions, including Villa Rica, Caazapa, Yuty, Encarnación, and the zone of the Upper Paraná.

In 1942, a competent observer reported the Hohenau Colony (about 50 miles northeast of Encarnación) to be the only area where tung was being produced to any significant extent; a rough estimate was that from 1,200 to 1,500 acres were in cultivation in this area. Some 8-year-old plantings produced a fairly good crop in 1942, and there were several new plantings of from 12 to 18 months of age. In the Colony Fram, to the northeast, some three or four hundred new plantings were reported. Experimental plantings were also known to exist in Villa Rica.

Argentine Tung

Tung growing in Argentina is confined to the northeastern part of the country which has been found to possess the requisite climate, soil, and rainfall. In the main, plantings are concentrated in the Territory of Misiones and adjoining sections of the Province of Corrientes.

One of the first plantings was made in 1929 in the Province of Corrientes, at Playadito, where 113 trees were established on a 2½-acre tract. Although some trees were set out in Misiones shortly afterward, it was not until about 1933 that interest became widespread, and plantings throughout the Territory were undertaken. Among these were quite a few substantial individual plantings; for example, the largest single plantation in this region at the present time consists of about 100,000

Tung fruit grows singly or in clusters, dependent upon the number of female blossoms in the flower cluster.

trees and had its beginning in a planting of 83,000 trees made in 1934.

In some of the first plantings, seeds from low yielding parent trees and badly formed nursery trees were planted, but in recent years determined efforts are being made to secure multi-cluster and uniformly high yielding trees through seed and plant selection. *A. fordii* is used almost exclusively in new plantings, although some *A. montana* specimens have proved healthy and vigorous even though low yielding. Some experiments in budding and grafting from high producing trees have been conducted recently, but the period of observation has been too short for any comparison with seedling trees.

In 1940, the Federal Government gave evidence of its intention to promote tung production when it announced a plan to set out 100,000 trees annually over a period of several years at the Experiment Station at Loreto, the Forestry Station at Posadas (both in Misiones), and the National Nursery in Bella Vista (Corrientes). With the purpose of developing vigorous stocks on which to graft the high-yielding *fordii* species, trees of the *montana*, *moluccana*, *cordata*, and *trisperma* species were distributed among these institutions.

Problems in Argentina

Two particular problems have beset tung production in Argentina. The first is that of controlling the hordes of ants which attack the trees throughout the entire growing area. Constant campaigns against this insect pest must be waged at least during the first three years of tree growth. In the Misiones area a satisfactory method of drying the fruit soon after it falls from the trees must be devised. Leaving the fruit to dry on the ground is not practicable as rains are frequent during the harvesting period (April through June). Progress has been made, however, in overcoming these difficulties.

The most recent agricultural census—that of 1936–37—indicated 564 Argentine farms, with 370,622 tung trees on 8,406 acres. Fruit was harvested from 37,648 trees which produced a total of 760,594 pounds, or an average yield of 20.3 pounds per tree.

The census recorded one farm with 900 nonproducing trees in the Province of Tucumán, and another in the Province of Salta with 200 nonproducing trees. All other tung trees were confined to the Territory of Misiones (66 percent of total number), the Province of Corrientes (30.3 percent), and the Province of Entre Ríos (3 percent). Of the 37,648 tung trees harvested that census year, 58 percent were in Misiones, 39 percent in Corrientes, and the remaining 3 percent in Entre Ríos.

Of that year's total tung fruit production, 53 percent was grown in the Province of Corrientes (30 percent of the total number of trees and 39 percent of the trees harvested that year). Except for 11,023 pounds (about 1 percent) produced in Entre Ríos, the remaining 46 percent of the 1936–37 harvest was gathered in Misiones (66 percent of all trees and 58 percent of those harvested).

Interest in the tung industry in Argentina has continued and increased. During the last two winters possibly more trees were planted than in any two previous years. The rapid rate of expansion is illustrated by the following: In one plantation with about 865 acres in tung trees, 494 additional acres were planted in 1941; another of 3,707 acres planted 500 acres more; in many instances comparatively small growers have doubled their acreage with plantings made in this same year. Obviously when these new trees reach bearing age, a sharp increase in tung fruit and oil production will be evident.

In 1940, however, there were probably not more than 4 or 5 plantations with a tung production exceeding 220,450 pounds of dried fruit. A similar number of plantations, perhaps, had a production ranging from the above figure down to about 88,000 pounds. Most growers, with more than half their trees still under 5 years of age, had a production of only a few tons. Production fell off in 1940 and 1941 because in both years Spring frosts occurred while the trees were in bloom, and the prospective crop was severely damaged. In 1942, most of the producing districts escaped injury from frost, and a large harvest is expected.

Of the three Argentine mills now expressing tung oil, two are located in the tung producing area and the third at the port of Corrientes. The latter mill processes fruit purchased in northern Misiones and shipped down the Paraná river. The mill at Posadas was built especially to handle the fruit from the large plantation of 100,000 trees, but some fruit is taken from small growers in the imme-

Tung fruit piled up for harvesting.

diate vicinity. The third mill at San Pipó accommodates the small local production in that section of Misiones, but the bulk of the fruit milled arrives by boat from producing areas along the Paraná.

Tung Industry in Brazil

Commercial plantings of tung in Brazil are found almost exclusively in the State of São Paulo. The first planting was made in 1930 by a private firm from seed nuts obtained in the United States. The next year additional seed were brought in from the United States and China by a large seed and nursery company and by the State Department of Agriculture.

Most of the tung planted in São Paulo is *A. fordii*. Experiments in São Paulo and Baía with *A. montana*, which is perhaps better suited to the climate in certain sections, have been handicapped because of the difficulty in getting seed nuts of this variety from Indochina. The few seedlings of this type now growing in São Paulo and Baía have not reached a bearing age.

The tung industry in the State of São Paulo has developed within the past 10 years and is still going through the stage of trial and experimentation. Despite the fact that the climate ranges from tropical in the north to temperate in the southern plateaus and other regions of high altitude, tung trees are being grown all over the State. Although experiments cannot be termed conclusive, those sections having a colder winter seem to be most suitable to tung, since the trees do better if they remain dormant for three or four months of the year.

Precise data on tung nut production in São Paulo are lacking. Production in 1940 is estimated to have approximated 772,000 pounds; of this, the two largest planters in the State are reported to have accounted for 249,000 and 220,000 pounds of nuts respectively. Production in 1941 was lower because of drought. Estimates for 1942 indicate a production of some 3,500,000 pounds of nuts.

The São Paulo Department of Agriculture reported in 1940 that 47 planters had a total of 652,710 trees; by 1941, the trees had increased to 724,210. All of these trees are not of bearing age, however, since the larger plantings have been made over a period of years. Estimates indicate that 200,000 trees were of bearing age in 1942 and that 75,000 will come into production during each of the next 4 years.

Prior to 1940 nearly all Brazilian tung nuts were used for seed. A small amount of oil was produced experimentally, but the first commercial output was expected in 1942. One large producing company succeeded in expressing oil satisfactorily in 1941, with some 33,000 pounds which was used in its own paint factories. Early in 1942, two additional tung oil mills were built. All three mills apparently have identical equipment—standard decorticating installations and one expeller press.

Although the State of São Paulo is the chief commercial producer of tung in Brazil at the present time, a few sizable plantings exist in the neighboring State of Paraná. According to two of the largest growers in this State, plantings total about 347,000 tung trees—57,000 of producing age, 144,000 two to three years old, and 150,000 a year old. One grove of 22,000 trees produced 66,000 pounds of fruit in 1942, or an average of 30 pounds per tree. The fruit is sold to mills in São Paulo and must be delivered at the grower's expense. As soon as trees are producing in sufficient quantity, Paraná planters hope to build their own mills.

In late years interest in tung production has also been aroused in the State of Rio Grande do Sul. By the close of 1942, about 500,000 trees or 6,178 acres were estimated to have been planted. Most of these represent very recent plantings, however, and probably not more than 50,000 have reached bearing age.

Encouragement of Production

A Brazilian Tung Oil Society has recently been formed to encourage the production of tung oil and assist in the development of the industry. Its stated objectives are to increase popularity of the cluster type variety; to assist planters by distributing instructions, pamphlets, and bulletins; to maintain contact with similar societies in other countries and keep its members informed of developments abroad; to furnish carefully selected seeds and plants; to guarantee members good market prices by purchasing harvests and arranging for oil extraction in adequate industrial plants; and to facilitate sale to the best available world market, by organizing farmers and working through the medium of some future organization to be set up with the aim of preventing speculation.

Investigation and experiment with tung have continued in most of the other countries "south of the border." Although Latin America has obvious potentialities as a producer of tung oil, no sudden metamorphosis in the supply situation is in prospect owing to the botanical character of the tree in question. Definite possibilities do exist, however, that in addition to the three already discussed, other American nations may soon be able to produce tung oil in sufficient quantities to meet their essential domestic requirements and even offer limited amounts to an immediate neighbor or two.

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TUNG IN LATIN AMERICA

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The bird on the flag of Guatemala is the quetzal. It stands for the love of liberty, as it is said that this bird cannot live in captivity. The quetzal used to be found in Mexico and in many places in Central America, where it was revered by the ancient Aztecs and Mayas. Later on, it was hunted for its plumes until it began to die out and to go farther and farther from the haunts of men; today there are few who have seen it alive.

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The Republic of Panama is famed as a fisherman's paradise.

Agronomic Institute, Campinas, São Paulo, Brazil.

Haiti's New Horizons

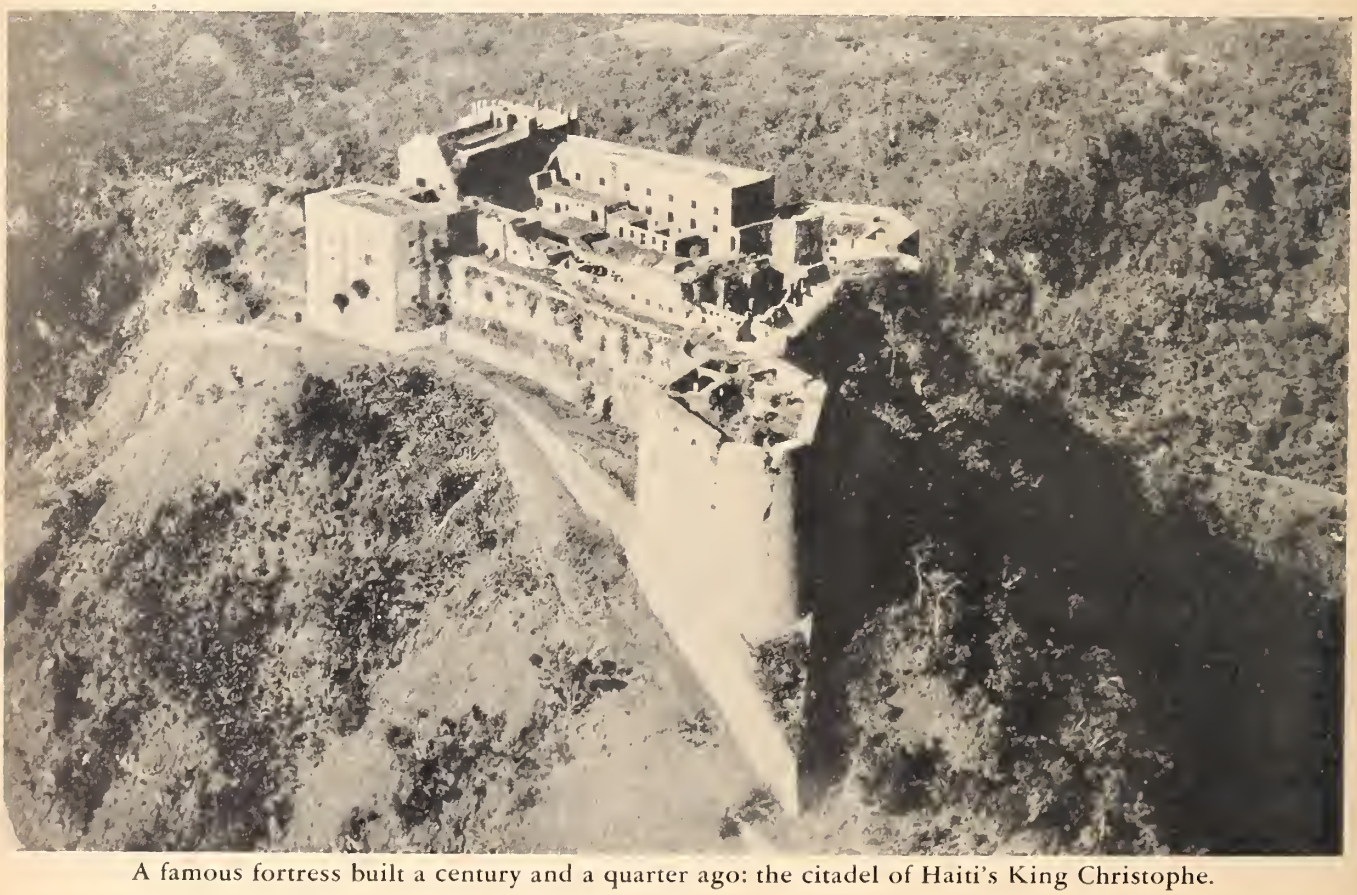
Smallest in land area of all Latin American republics, Haiti has the greatest density of population. Through intelligent integration of agriculture and education, the Republic is carrying out an active program of self-improvement as well as continuing its historic policy of inter-American friendship.

by PHILIP LEONARD GREEN

Haiti, first of the Latin American nations to proclaim its independence, was also the scene of the first European settlement in the New World. It was at La Navidad, on Christmas Day, 1492, that the Spaniards under Columbus established their first colony. In taking possession of the island, they called it *La Española* or *Hispaniola*.

Off the northwestern coast of Hispaniola, on the island of Tortuga, English and French pirates established a center of operations; later the French drove out the English. In time, the French filtered over to Hispaniola itself, where they established settlements on the northern coast. Spaniards from the eastern part of Hispaniola repeatedly tried to oust them, but to no avail. Finally, in 1697, Spain recognized French ownership over the island's western third. This part of Hispaniola was then formally organized as the French colony of St. Dominguc, and during the hundred-odd years of French rule, it became one of the richest colonial domains of history. Unlike any other American Republic, Haiti traces the European backgrounds of her culture to France.

The French first developed the lowlands on the northern coast, around what was then the capital—Cap Français, now called Cap Haitien. Later, they spread out toward the south. The present capital, Port-au-Prince, laid out in 1749, was the result of increased agricultural productivity in the region known



A famous fortress built a century and a quarter ago: the citadel of Haiti's King Christophe.

as *Cul de Sac*. Some of the long stone aqueducts which were part of the elaborate irrigation system set up by the French, are still in use.

Sugar cane was the main crop, but other products added to the fabulous wealth of this prosperous colony. Among these were indigo, bananas, cacao, coconuts, manioc, yams, cotton, and coffee—an eloquent commentary on the variety of commodities that can be grown in the country.

As in many other European colonies of the New World, slaves imported from Africa supplied the manpower needed to develop the colonial economic structure. St. Domingue soon had more Negroes than French in its population. As in other regions of America, a new mulatto race grew up. Many of these mulattoes were freed from slavery by the French and were sent to study in Paris. There they came under the influence of French revolutionary doctrines.

Dissatisfaction with the mother countries grew apace in America during the last years of the eighteenth and early years of the nineteenth century. St. Domingue was no exception, and on July 1, 1801, the Haitian patriot Toussaint L'Ouverture declared the independence of the island from France. This independence was reaffirmed by General Dessalines on January 1, 1804, when the new Republic was given the island's aboriginal name—Haiti—meaning "land of mountains." After an invasion of the eastern or Spanish part of Hispaniola, Haiti held sway over the entire island for 40 years.

In those early turbulent years of national history, the old French irrigation system rapidly broke down. People could no longer farm the dry lowlands. Accordingly, the population decreased, except in the wet northern plain. Many people moved to the southeastern part of the country, to the central plain, and to the mountainous areas. There they began to found small properties and raise their own food; they set the present pattern of land tenure which has made Haiti outstanding as a land of small landholders. To this day, over 75 percent of Haitian land is operated by its owners.

The rural social pattern of the Haitian people can be described as basically African, influenced somewhat by the French. While using comparatively primitive methods, the Haitians in the country are unusually good farmers. They have to be, for with its over 280 inhabitants to the square mile, Haiti is the most densely settled of any Latin American country.

The size of the entire Republic is only 10,200 square miles. Thus this smallest of the Latin American Republics is about as large as Maryland. Into that area are crowded about 3,000,000 people, of whom about 95 percent are of pure-blooded African Negro stock. The 5 percent who are mulattoes, together with 5 percent of the Negroes, constitute a well-educated elite, who dominate the political and social life of the country. They

Courtesy of Pan American Union

Native house in rural district.

speak French, while the populace at large uses a patois, or mixture of African and French, called *creole*.

For a long time after separation from France, Haiti suffered from political chaos. It is to the country's everlasting credit that, having so many obstacles to overcome, it has gone far on the road of self-development. Fundamentally, that road has been one of agricultural progress.

After colonial times, growing sugar for export stopped as a result of the English blockade which closed the French market. But coffee cultivation went on.

Within recent years, other items have been added to the list of Haitian products which find their way into foreign markets. Among these products are bananas. In 1930, there was no commercial growing of bananas; yet in 1940, over 3,000,000 bunches were produced, and most of them on *small farms*. Cotton, sugar, and sisal have also been increasingly developed as export crops. Among the new products now being promoted are limes and other tropical fruits, vegetable oils, insecticidal plants, rubber, and such economically important woods as bamboo, mahogany, and teak. Incidentally, the reforestation necessary for the development of these last-named new sources of wealth will also be helpful in correcting the soil erosion caused by charcoal-making and previous logwood cutting.

The trend to a diversified agriculture was given definite impetus when, in May 1941, Haiti signed an agreement in principle with the United States for the development of rubber, bananas, spices, food, fibers, naval stores, oil-bearing plants, and forest resources; for the improvement of cacao; and for the stimulation of small handicraft industries.

Soon afterwards, a unique government corporation was formed. Its name is the Société Haitiano-Américaine de Développement Agricole (called SHADA for short). Capitalized at $1,000,000, all its stock is owned by the

Haitian Government. One of the recent projects of major current interest undertaken by the corporation is the extensive cultivation of a rubber-producing vine called *cryptostegia grandiflora*, which yields a high-grade latex and which, in Haiti, grows to maturity in 6 months.

Yet it should not be understood that the corporation is primarily interested in the plantation type of development. In fact, its plantations are expected to serve only as sources for planting materials and as laboratories to supply the needs of small farmers.

These efforts should make themselves felt in two ways. The first advantage to Haiti should be a lessened dependence on outside sources for many necessities. A considerable portion of these could be produced at home.

Secondly, Haiti stands to benefit by the creation of additional sources of wealth through an effective program of agricultural diversification; at the same time the country would be helping the cause of inter-American solidarity by supplying needed commodities.

At present, coffee accounts for over half of Haiti's exports. Together with sugar, the total involved is about $7,500,000 a year. Due to a varied terrain, Haiti could produce a variety of crops not now being grown at all or grown in too limited a quantity to enter into export trade.

Manufactures, too, could be expanded with beneficial results. For a long time, Haiti's manufacturing industries have largely concentrated on the first processing of coffee, sugar, and sisal. Among other industries are cabinet-making, distilling, and the manufacture of soap, cigarettes, and bricks. Particular emphasis is being placed by the Government on the expansion of handicrafts.

Mineral wealth, too, is available and, if scientifically exploited, might still further help to strengthen Haiti's economic foundations. In addition to gold and silver, there are copper, iron, nickel, antimony, coal, petroleum, sulphur, kaolin, limestone, and other mineral products.

Underlying the developments outlined is an intent to improve the hygiene, security, and standard of living among the people at large without undue delay. The entire educational system of the Republic reflects this objective.

In this connection it is noteworthy that Haiti groups agricultural extension work and the public schools together under one Minister who has been trained in both fields. The courses in psychology, rural sociology, biology, botany, and agronomy are identical in that part of the course which is taken by both public school teachers and extension agents. At a recent regional institute of public school teachers, the planting of over 1,000 trees by the teachers constituted one of the important undertakings. Time was equally divided among three activities: shop and craft work, agriculture, discussions and planning.

In 1926–27, the Service National de la Production Agricole et de l'Enseignement Rural started a program for establishing 50 farm schools. The hatbraid industry, now an important part of the national economy, had its origin there. The increase in banana and rice cultivation is also due to the work of these schools.

There are now 460 rural schools in Haiti, with a total of 35,000 pupils. Agriculture and cattle-raising form the basis of the curriculum.

English is now an obligatory study in all schools of Haiti. The fact that Haitian students are coming in ever-greater numbers to the United States for advanced learning, responds to an increasingly closer rapprochement between the country and the United States. The Haitian Government has repeatedly declared its solidarity with the United States and other American Republics in the present crisis.

But Haiti is no newcomer to the practice of genuine inter-American cooperation. Haitian soldiers fought at the battle of Savannah in the Revolution of England's North American seaboard colonies. Haiti sent help to Simón Bolívar in his struggles for independence in South America. Hence, in contributing her efforts to the common cause, Haiti is carrying out a well-established historical tradition for which other American nations are deeply grateful.

Courtesy of Pan American Union

Carrying bundles of straw, to be used in basket-making.

ALONG THE *Agricultural Front*

▲Collaboration In The Americas

In order to provide appropriate integration of programs of the Latin American experiment stations which have been established under agreements with El Salvador, Ecuador, Nicaragua, and Peru, provision has been made in each case for a bilateral governing commission, with one representative from the United States and one representative from the other country concerned.

Dr. Ross E. Moore, Assistant Director, Office of Foreign Agricultural Relations of the Department of Agriculture, has been appointed as the United States representative on each of these commissions.

In late December Dr. Moore returned from Latin America, where he had been conferring on agricultural collaboration. In Ecuador he attended the meeting of the Board of Directors of the Corporación Ecuatoriana de Fomento and assisted in developing a program for the agricultural experiment station which had been set up previously.

In Peru, he worked with David Dasso of the Amazon Corporation, Pedro Recavarren, Director of the Dirección de Tierras de Montaña y Colonización, Pedro Beltrán, and Dr. Benjamin J. Birdsall, on the 1943 program for the agricultural experiment station at Tingo María.

In Brazil, Dr. Moore discussed agricultural collaboration with the Minister of Agriculture, Dr. Apolonio Sales, and with Dr. Felisberto Camargo, of the Instituto Agronômico do Norte.

In Colombia, he developed preliminary understanding for the establishment and operation of an agricultural experiment station in the Urabá region.

▲Mexico a Possible Source of Rapeseed

It is estimated that Mexico could produce rapeseed oil in substantial quantities and at about the same price as that ruling for sesame seed oil. In the past, rapeseed has not been considered an article of commerce among the oil crushers because of a relatively small demand due to the fact that it grows largely wild, is not uniform, and is often dirty. Annual trade estimates appear to have fluctuated between 1,500 and 2,000 tons, but is believed that from 7,000 to 8,000 tons of seeds could be gathered.

▲New Association of Cuban Cattlemen

According to a recent decree, President Batista has authorized the creation of the National Association of Cattlemen of Cuba. Membership will be required of all persons who are engaged in the cattle producing industry in Cuba and who have registered brands. The Minister of Agriculture is entrusted with the fulfillment of the decree.

▲Final Agreement for El Salvador Experiment Station

On October 21, 1942, an agreement was signed by the Governments of El Salvador and the United States for the establishment of a cooperative agricultural experiment station in the Republic of El Salvador. The purpose of the station is to promote the production of such basic and strategic tropical products as fibers, insecticidal and medicinal plants, vegetable oils, and rubber, and to work on other problems of interest to the agriculture of El Salvador. The station will be located at Hacienda Zapotitán, some 30 kilometers from San Salvador on the Pan American highway uniting the capital with Santa Ana.

▲New Institute Gets Under Way

Dr. E. N. Bressman, Director of the new Inter-American Institute of Agricultural Sciences, has returned from Costa Rica, where he spent several weeks working out a contract with the Government of that country to provide for the operation of the Institute to be established near Turrialba. This contract has already been unanimously approved by the Costa Rican Congress, and the Government has given 1,250 acres of land to the Institute, which also has an option on an additional 1,250 acres.

With the present scarcity of materials, it will be very difficult to get construction of the Institute buildings under way, but some houses for personnel will be built.

Much progress has been made. Research work on vegetable production, breeding, and processing is to begin immediately, and in a year's time 50 students should be doing work at the graduate level. Although there will not be an extensive curriculum in the beginning, certain formal courses, based primarily on problems of graduate students, will be given. Later on, formal courses will be developed around the Institute faculty.

Assisting Dr. Bressman in the work of getting the Institute under way were Dr. Wilson Popenoe, Head of the Escuela Agrícola Panamericana in Honduras; Rex A. Pixley, Business Manager of the Institute; Mariano R. Montealegre, Secretary of Agriculture of Costa Rica; his assistant, Luis Cruz B.; Charles L. Luedtke, Agricultural Attaché of the American Legation in San José; and Robert A. Nichols, Agriculturist of the Institute. The staff of the Bureau of Plant Industry Rubber Experiment Station also cooperated in getting the work under way.

▲ Dairy Production in Brazil Expanding

Brazil has made important progress in the development of its dairy industry in recent years and holds great possibilities for future expansion, according to information received in the Office of Foreign Agricultural Relations. Conditions of a few years ago are being overcome by more care in combating diseases, sanitation, refrigeration, and selection of breeds.

Brazil, which once imported dairy products, is now self-sufficient, although its per capita consumption of milk and dairy products is small compared with the United States, Canada and peace-time Europe. Brazilian butter production almost doubled from 1920 to 1939, and now small quantities are being exported. Production of cheese has increased greatly, but the country remains a net importer.

▲University of Concepción Plans New College

The University of Concepción, one of Chile's three universities, may establish a college of agriculture in the very near future, according to officials of the University and of the Agricultural Society of the South. Detailed plans for the new college call for the formation and development of a scientific and practical agricultural center under the administration of the University, but located at the nearby city of Los Angeles, on a farm, or *fundo*, now being used as a Genetics Experiment Station of the Chilean Ministry of Agriculture. Plans are being studied by Dr. Enrique Molina, Rector of the University of Concepción, and by Dr. Alfredo Wolnitzky, Director of the Department of Agronomy of that University.

At present there are only two Colleges of Agriculture (Escuelas de Agronomía) in Chile. One is a part of the University of Chile, a national institution, and the other is a unit of the Catholic University. Both are located at Santiago.

▲Mexico Finds a Substitute for Tung Oil

There exists in Mexico a tree commonly known as *cacahuananche* which produces a nut used by the Indians and which appears to have properties as a drying oil. According to tree experts the *cacahuananche* grows wild in the states of Guerrero, Morelos, Michoacán, Oaxaca, as well as in Central America, and the nuts are used by the Indians as a source of light. From the oil or fat which dissolves readily in ether, benzine, or carbon bisulphide, is extracted a fatty acid which is good for making candles. Preliminary reports from field contacts state that a total of 1,200 tons per year might be obtained in the state of Guerrero.

▲Argentina Establishes New Egg-Powder Industry

The principal factor in the establishment and progress of the egg-drying industry in Argentina has been the need of the United Kingdom for food in concentrated form. Having been started as recently as 1941, the industry is still very new, but it has progressed very rapidly during the past year. Several new plants have been built; the original plants have been enlarged; more modern equipment has helped improve the quality of the finished dried product.

Argentina can produce dry-egg powder at a lower price than the majority of major egg-producing countries of the world because of the availability of eggs at prices of about 12 cents or lower per dozen during the heavy producing seasons.

Although at least one plant is located in each of the cities of Rosario and Santa Fe—near large producing areas—most of the egg-drying plants are in Buenos Aires. The Argentine poultry industry is concentrated in the provinces of Buenos Aires, Entre Ríos, central and southern Santa Fe, and southern Córdoba. Buenos Aires is more or less in the center of this zone, and both eggs and chickens are transported there in large quantities, by truck, rail, and river boat. Eggs are therefore readily available for drying, and the powder can be packed and shipped with a minimum of labor and cost.

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AGRICULTURE IN THE AMERICAS — MADALINE W. NICHOLS, EDITOR

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André Liautaud
OUR MUTUAL FRIEND

When Columbus discovered Haiti on the first of his four voyages, he found an agricultural and fishing people who were soon slain by the Spaniards or exploited to death in search of gold. It was not long before Haiti was stripped of its Indian inhabitants, reoccupied by Negro slaves, and finally deserted by the plundering Spaniards who were not interested in the pursuit of coffee, maize, tobacco, cocoa, manioc, bananas.

When the French buccaneers arrived in 1630, they came as planters, and Haiti became one of the most prosperous agricultural communities in the new hemisphere. How the Republic developed from this beginning is a drama of revolution, massacre, confusion.

The clue to Haiti's present progress is its accent on rural education. It is significant that President Elie Lescot has designated to the Washington post André Liautaud, Haiti's outstanding disciple of rural education.

Monsieur Liautaud's career is the diary of an educator. At 19 he was a rural school teacher. At 21 he attended Columbia's Teachers' College, returned 5 years later to receive a BS in education. In between, he had been appointed Assistant Director of Rural Education and was devoting his energies to teaching and supervising. In 1938, he was engaged in the land resettlement project which had been established to repatriate approximately 1,500 Haitian families which had settled in the Dominican Republic. Five large colonies were set up, each with an agricultural experiment station, a school, and a clinic. In the mountains, the colonists were encouraged to grow coffee; in the plains, cotton, tobacco, cassava root, and rice were the staples.

Until July 1941, when he was sent to Canada as Haiti's General Commissioner at the Canadian International Exhibit, Monsieur Liautaud assisted in directing this rehabilitation program. On his return from Canada in October 1941, he became Director of Rural Education.

Although only 25 percent of Haiti's population is enrolled in its 400 rural schools, the new Minister is convinced that the expansion of this program is the essential thing for Haiti. It is a system of education that embraces agriculture, occupations (weaving, basketry, carpentry), and the three R's too. "Rural schools," says André Liautaud, "are more than vocational centers—they represent the social pulse of the community."

The next advance followed in less than a year when Haiti's young educator was appointed Undersecretary of Finance, National Economy, and Commerce, a cabinet position which gave him jurisdiction over price control.

Haiti has suffered from a bad national start, but now—with the emphasis on education and a modern diversified agricultural program under the direction of men of André Liautaud's training, understanding, and intelligence—the program of this Caribbean Republic promises to be sure and swift.

ARGENTINA

Land

The total area of Argentina is roughly 700,000,000 acres, an area larger than all of the United States East of the Mississippi River plus Arkansas, Louisiana, and Oregon. The latest Argentine agriculture and livestock census (1937) covered 431,636,000 acres of farm and ranch land. Of this amount, about 16 percent was cultivated land, 55 percent was pasture land, 21½ percent was natural and cultivated woodlands, and the remaining some 7 percent was land unsuited for agriculture and livestock.

Climate

With the exception of an area of some 31,000 square miles in the Torrid Zone, Argentina lies within the South Temperate Zone, with January the warmest month and June and July the coolest.

Population

In 1939, the Argentine population was estimated to be around 13,000,000 of which about one-fourth was rural.

Agriculture

Slightly more than two-thirds of the country's estimated 1937 agricultural and pastoral production was agricultural. Wheat is the most important single crop; in 1937 it accounted for about a quarter of the value of all farm and ranch production. Next in order of importance are corn, flaxseed, oats, barley, and rye. Other important crops besides cereals and flaxseed are forage and fodder crops, sugar cane, cotton, peanuts, yerba mate, sunflowers, tobacco, garden-stuffs and vegetables, and temperate-zone fruits.

Meats, meat products, hides, and skins accounted in 1937 for about a fifth of the value of all farm and ranch products. Wool represented 6 percent of the value of total production; milk, 4 percent.

Cattle are raised in most parts of Argentina, but chiefly in the provinces of Buenos Aires, Santa Fe, Entre Ríos, Corrientes, Córdoba, and in parts of the territory of La Pampa. Argentina is the world's largest surplus producer of beef, supplying, in 1937, about one-half of the world's total exports of beef.

As a sheep-grazing country, Argentina is exceeded only by Australia and the Soviet Union. In 1937 the country supplied about one-sixth of all the mutton and nearly one-tenth of all the wool entering international trade. In the production of goats, Argentina is the second ranking country of Latin America. Hog raising is also becoming important.

Forests

Of the total Argentine area, over 123 million acres are forested. Quebracho, with its high tannin content, is the most valuable single forest product. About 80 percent of the world's supply of this wood is in Argentina.

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Agriculture in the Americas

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UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

March 1943

NAMES & NEWS

Mexican Exposition

President Manuel Ávila Camacho gave the inaugural address at the Annual Agricultural Exposition of Mexico, which was held at San Jacinto in the Federal District from November 8 to 15, 1942.

Two other official addresses, given at the opening and at the close of the Exposition, furnished a review of scientific agricultural progress in Mexico during the course of the year and indicated the active interest of the present Ministry of Agriculture under *Ingeniero Marte E. Gómez.*

The opening address by the Director General of Agriculture, *Ingeniero Darío L. Arrieta,* covered such topics as plant breeding, plant propagation, insect and disease control, fertilizer research, and agricultural engineering. Señor Arrieta noted specifically the scientific research on fertilizers for sugar cane and the research on wheat, corn, beans, potatoes, sesame seed, cotton, rice, tobacco, henequen, rubber, olives, and fruits; current interest in the production of high yielding disease-resisting seeds, adaptable to different soils and climates; plant sanitation, with laboratory identification and study of pests and the application of especially successful biological controls on the cottony cushion scale and the citrus mealy bug and black fly; agricultural legislation behind the various campaigns for pest control and the establishment of quarantine zones; a study of agricultural machinery—both imported and of national manufacture.

The official address at the close of the Exposition was given by *Dr. Quesada Bravo*, Director General of the Livestock Service. In his analysis of the efforts made by Mexican authorities toward solving livestock problems, Dr. Bravo particularly noted the energetic campaign against livestock pests and diseases and the search for species of animals which will insure high production in the various economic and natural elements. He reported on the improvement of national breeding farms and on the studies being carried out to provide animals with better feeding in order that the economic complex of land, forrage, and livestock may increase the national livestock production.

New Work in Climatology

Dr. Alfonso Contreras Arias, distinguished meteorologist from the Department of Agriculture and Development in the Federal Government of Mexico and Professor of Climatology in the Government Agricultural College at Chapingo, has come to the United States to plan the immediate establishment of two climatological observatories in his country.

Dr. Contreras recognizes that the standard climatological observations are not adequate for agricultural investigations and is gathering information on special instruments and techniques for studying the climate of the low part of the atmosphere, the zone where the plants actually live.

Among the published works of Dr. Contreras are his *Problem of the Classification of Climate* (one essay from which was published in English translation in the *Monthly Weather Review*), *Map of the Climatological Provinces of Mexico, Essay on the Climate of Rubber Plants, The Climate of Wheat in Mexico,* and *The Climate of the Different Regions of the State of Puebla.* At present Dr. Contreras is collaborating with Dr. C. W. Thornthwaite, of the United States Department of Agriculture, on a map of the climates of Latin America.

Agriculture IN THE *Americas*

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Argentina Loves Her Cattle

Though crop production has now surpassed the cattle industry in value in the Argentine economic pattern, Argentina's pride is still centered on her cattle. Dr. Taylor describes this feeling and interprets its basic importance in any understanding of Argentine psychology.

by CARL C. TAYLOR

One doesn't understand Argentine culture if he doesn't know what Argentines think and feel about their cattle. From facts and fiction about the gaucho to export statistics, large segments of the Argentine population are fed on cattle lore as consistently and persistently as the whole Argentine population is fed on beef. In Argentina the dominance of the cattle industry in national life goes back to the very beginning of Argentine national history. The great humid pampas were a livestock paradise, and the introduction of alfalfa has expanded the efficient cattle producing area a good distance beyond the humid pampas. In much of Argentina, cattle are like cotton in Texas, tobacco in Kentucky, or corn and hogs in Iowa. Land use, economic arrangements, and social class structure are all conditioned, if not dominated, by the role which cattle play in the national life and culture.

From the day when wild cattle, wild land, and wild men represented the cattle industry in Argentina until a day in August 1925 when the Palermo grand champion shorthorn bull sold for 152,000 pesos (United States equivalent at that time $62,320), "cattle culture" has been the dominant motif of Argentine culture. It is more important to understand what the people of the Argentine Republic think and feel about their cattle than to know that they all speak Spanish or to believe that they all dance the tango. If anyone thinks otherwise, let him touch upon some Argentine's pride or prejudice about Argentine cattle or beef and see how quickly he will discover that he has touched the heart string of Argentina's feeling. "That Argentine purebreds are the best in the world"; "that the Palermo Exposition is the equal or superior of England's Royal or United States Royal or International"; "that Argentine beefsteaks can't be equaled in any other country," are statements often heard and seldom questioned by anyone—native or foreigner—living in Argentina.

The march of the champions. Palermo. August 1942.

Argentina first entered the channels of world trade through the medium of cattle products and became the great nation that it is because it became one of the world's great sources of meat supplies. Although the country exports more beef than any other nation in the world, it exports only about 30 percent of its total production; the remainder it consumes at home. Its citizens are the greatest meat-eating people in the world, consuming 300 pounds per capita annually, 88 percent of which is beef. This is more than twice as much meat and more than four times as much beef as is consumed per capita in the United States. From family dinner tables to international balances of trade, cattle are tremendously important to the people of Argentina.

If one can witness the great annual Palermo Rural Exposition, especially the "parade of the champions" on Sunday and the auction of the prize winners on the days immediately following, he will begin to understand the national psychology and the social significance of cattle raising in Argentina. No other cattle show in the world holds the public status enjoyed by the Palermo Exposition. The President of the Republic, his Cabinet, and foreign

diplomats are always present at its opening. People come from all sections of the nation to witness this grand spectacle.

In the city of Buenos Aires traffic lanes are all regulated to accommodate the official parade and those going to the opening of the Exposition; it is almost impossible to travel in any other direction than Palermo. During Exposition week the metropolitan papers give more space to Argentina's fine cattle than to national and international news. Several Buenos Aires papers issue special graphic supplements on the opening day or on the Sunday following; papers large and small in the interior of the country follow suit. Those who can't attend the Exposition or auction of the champions, read the newspaper accounts or listen to radio broadcasts about the events of the week. Even female domestic servants and other working people in cities, many of whom have never spent a day of their lives in the country, talk about the champion cattle and the prices paid for them at the auction.

In addition to this National Rural Exposition staged annually at Palermo, regional and local expositions are held throughout the nation. They are little Palermos, with their own grand champions, their parades of the premium winners, and their homages to prize cattle and the men who produce them.

The producers of the more than 800 entrants in the Palermo Exposition and of the almost countless hundreds in the breeding herds from which these entrants come, are the rich men and socially elite of Argentina. They are the members of the Argentine Rural Society (La Sociedad Rural Argentina), one of the oldest and most famous farmers' organizations in the world. They, and not Federal or Provincial Experiment Stations, have provided the leadership which has gone into the evolution of the great cattle herds of the country. The fact that cattle began to divide the livestock field with sheep more than a generation ago and that before the present

Estancia residence and park.

world war the annual value of cereal exports quite regularly trebled that of beef, have not served to diminish the prestige of the nation's cattle industry and of its leaders.

Argentina's cattle are produced almost altogether on large estancias, which have become national economic and social institutions. Equipped with the efficient and practical physical installations and technologies essential to cattle production, they are carefully and economically managed and manned by traditionalized employees who have deep pride in their work.

A great estancia is more picturesque than a Kentucky blue grass race horse farm, because it is bigger and more panoramic. It contains anywhere from 5,000 to 50,000 acres of land, nearly all of which are in grass. Located on flat or slightly rolling land; stocked with highly bred, beautiful cattle; fenced with well constructed and maintained seven-wire fences; dotted with frequent groves to provide necessary shade—the whole panoramic scene is oriented to a magnificent estancia residence and its surrounding park. The park generally occupies a

Many of the estancias are fully fenced.

hundred acres or more of ground and has been landscaped by some architect or artist who planned and planted the beautiful parks of the city of Buenos Aires. The great estancia house may contain anywhere from 20 to 50 rooms and, like the park, it was designed and constructed by some outstanding artist. These country homes are the pride not only of their owners, relatives and friends, but of thousands of other Argentines who believe that there are no rural residences in the world which equal them in beauty and grandeur.

Large, well kept, beautiful estancias are places which tourists visit and admire. But an estancia is far more than a show place. It is a place where cattle are produced for economic profit. Beef cattle are fattened for the market without feeding them a pound of grain or other concentrates. They are grazed on grass or alfalfa.

Although the most spectacular, the annual Palermo Exposition is only one of many symbols of Argentina's cattle culture. A more mundane, certainly equally important manifestation, is the place of beef in the daily diet of the Argentine people. The "bife" is far more universal on the farms and in small towns and large cities in Argentina than are ham and eggs in the country districts of the United States. Roasts (*asados*) are as traditional all over Argentina as barbecues are in some sections of the United States. Argentine steaks (*lomos*) are famous among foreign visitors, but they are far more famous among middle and upper class Argentines who may know nothing about the food habits of other parts of the world. Meat—beef always predominating—is served at every meal, and it would be difficult to conceive of more ways of preparing it than are known in Argentina. Meat is more than just one type of food; it is a symbol of all food and as such represents the staff of life for Argentine people. Prices for beef are as important for families that must purchase it in Buenos Aires as the prices of bread or milk are in New York City, and this is true alike for rich and poor, intellectuals and illiterates.

There are still other, more subtle, manifestations of cattle culture than the physical and economic facts connected with cattle and beef. A whole body of literature and folklore in the nation has stemmed from, or grown directly out, of cattle culture. The gaucho has become a romantic character in poems, songs, and novels. The Argentine riders are characters of both fact and fiction. Just as on the western plains in the United States, the horse and horsemanship are a part of cattle culture. *The Gaucho Martín Fierro*, a poem by José Hernández, has been one of the most widely read pieces of popular literature in Argentina.

Arguments rage over the issue of whether the gaucho was a pure blood Castilian adventurer or just a bad man of Argentina's wild west. Of one thing one can be sure: he was a part of the Cattle Kingdom of Argentina. His type is long since gone, but his blood courses through the veins of many a present day Argentine and to mention him brings forth a flood of traditional tales about early cattle days in the country. The gaucho type of dress—trousers, boots, hat, and belt—have been in style for a hundred years, and his knife is today as universal among rural people as the jack-knife is in the United States.

Argentine saddles are of many kinds, all good, and many of them so embellished with silver as to be worth

A gaucho painting by Cesáreo Bernaldo de Quirós. The scene is an old-time country store, with gauchos with typical dress and weapons.

hundreds of pesos; the bridles, sursingles, spurs, and lariats are in keeping with the saddles. Used by tradition worshippers of the gaucho, they are to be seen at rural fetes all over the nation. And the gaucho's everyday working equipment is represented in the jewelry and ornaments worn by city and country people alike. Watch fobs are made in the form of "boleadoras", those lariats with ends weighted with stones or balls, and nicely calculated to wrap around the legs of a running animal and neatly trip and fetter it; bracelets are strung with little stirrups, knives and knuckle bones, maté cups and "bombillas" through which maté is sipped.

In the country districts one finds saddles, "boleadoras," lariats and whips made of rawhide; hunting pouches, water containers, and knife handles made out of cattle horns; chairs and stools and sometimes ovens and tables built out of bones; knuckle bones used in a famous country gambling game; and skeletons of cattle heads used as scarecrows. Small shops in Buenos Aires sometimes handle nothing but leather purses, wallets, and kodak albums made from the skins of unborn calves. Larger stores handle elaborate stocks of leather goods made from Argentine cattle hides. If anyone comes to Argentina and leaves without a souvenir of the nation's cattle culture, it will be because he hasn't seen or sensed the heart of the nation.

A major element in a nation's culture which reaches far back in its economic history has attached to itself a large and diverse body of technologies, techniques, customs, and traditions. It would be difficult to conceive of a culture trait which illustrates this fact better than that of cattle culture in Argentina.

Early estancias were formed by enclosing great areas of land with wire fences, domesticating the wild cattle and horses on the pampas, and using the gauchos as cowboys. Water for this large body of domesticated animals had to be partially supplied by wells and windmills. Wire fences, the windmills, branding irons, boleadoras, lariats, saddles, and spurs were all necessary technologies of cattle economy. The mud (adobe), thatched hut (rancho)—the gaucho's home—came to be the traditional farm home. When herd improvement and grazing land improvement developed, the dipping vat, de-horning shute, barns and improved fences became prevalent; alfalfa and other grasses were introduced to take the place of coarse pampas grasses, and premiums for improved sires and dams were established. Today Argentina has the largest cattle ranches in the world, enclosed by the best fences I have ever seen. Herds have been improved by the importation of the finest pedigreed breeding stock that can be purchased in other countries.

Out of this long and exceptionally successful development of the nation's cattle industry there have come the gaucho in fact and fiction, the estancia and the estanciero, the Palermo and other cattle expositions, considerable industrial development connected one way or another with cattle products, and a great beef and hide export business. The cattle business no longer dominates the agriculture of the nation so far as use of land and occupation of farm people are concerned; sheep, cereals, fruits and grapes, cotton, sugar cane, yerba mate, rice, tobacco, and other crops constitute far more of Argentina's agriculture than does the cattle industry.

But no other agricultural enterprise is of such long standing, has meant so much to the nation's economy development, has so well organized and socially prominent a body of citizens representing it, or has been so thoroughly symbolized in expositions, history, romantic literature, art, and popular song and story as the cattle industry. Argentine people themselves are not fully conscious of the powerful psychologies which their cattle culture has developed, but any one who comes to know them at all well soon becomes convinced that when you touch Argentine cattle or beef, you touch the heart of Argenina's natural pride and prejudices.

Cattle are finished on pasture without feeding.

A Land Policy for the Americas

It is the responsibility of Government to establish wise agricultural policies, based upon an appreciation of the importance of conserving the resources of the land heritage.

by ALFRED ATKINSON

A nation's land is its heritage—its most enduring resource. Future generations throughout all time will be dependent on the land as a basis for their homes and on the productive capacity of the land for their food and fiber supplies.

It must ever be the responsibility of Government to establish and apply wise agricultural policies, based upon an appreciation of the importance of conserving the resources of the land-heritage for this and succeeding generations.

Conditions behind such policies in the several countries of North, Central, and South America will, of course, differ. But modern scientific agricultural planning is a slow process, dependent upon research in many fields. Latin America may well be interested in the course of planning in the United States as indicative of lines of future procedure possibly applicable elsewhere.

In the United States scientifically planned agricultural policies became a necessity with the passing of the frontier. Until the opening of the last 20-year period, there were still large areas of unsettled land in the western half of the United States. The effects of the availability of a resource of this kind manifested themselves in at least two dominant ways.

In the first place, land became a commodity to be bought and sold, and this encouraged land speculation.

The second effect was the feeling on the part of settlers that, if conditions were found to be unfavorable, or developed unfavorably, in a particular location, they need not struggle to modify these, but could abandon the old land and move to more favorable territory. The slogan "Go West, young man!" influenced the attitude of thousands of pioneers throughout several generations. They were impatient of obstacles—eager to find an "easy" situation where crops could be raised and a livelihood secured with the minimum of effort and expense.

By the beginning of the 1930's, most of the productive open land in the western United States had passed into private ownership. Because of this, the President of the United States directed that remaining areas of the public domain should be withdrawn from homesteading. This particular phase of pioneer development of the United States thus came to an official end.

The disappearance of frontiers did not immediately change the attitudes of those who possessed the "frontier" spirit. The spread of the knowledge that productive free homestead land was no longer available did not stop the tendency of those who found their farm situations unfavorable, to load up their belongings and move west.

When soil blowing became serious in certain of the Central Mountain States a few years ago, the farmers migrated to California and other States farther west, in the hope of finding new opportunities. Their disillusionment was a natural result of the disappearance of an opportunity which had existed from the foundation of the United States and which had appeared to be limitless.

Many of the migrants who were unable to locate themselves favorably in these fully settled western areas returned to their former locations, awakened to the fact that they would have to manage their old lands in such a way as to make a livelihood, since new land was no longer available.

They quickly discovered that the problems could not be solved on single farms. They turned to their neighbors for a solution, but the communities soon realized that even this was not enough—the problems were more than State-wide. They were, in fact, national problems.

Need for National Policies

The existence of the needs which called for the establishment of national policies had not been generally recognized prior to the close of the physical frontiers. However, during this period of regional awakening, the Federal Government, with patriotic vision, had likewise recognized the need and accepted the responsibility of meeting it. Departments of the Government proceeded with the assembling of information on which successful agricultural policies might be established.

The Federal Government of the United States has now undertaken studies and is proceeding to establish policies for the country. The accumulation of information on problems closely allied, or more remotely related, to agriculture has resulted in enlarged information, and it is timely to see to what extent we can integrate the findings

of these related researches with the findings of scientific, systematic agricultural research which, with a few exceptions, was first undertaken less than a century ago. Since that time agricultural studies have resulted in the accumulation of a body of tested findings of great fundamental significance. As results of these studies have become available, they have exerted an important influence on the formulation of agricultural policies.

One condition imposing limitations on our understanding of agriculture is the relatively short period of dependable climatic records. Our history of climatic conditions and of the practices of people of earlier periods is relatively very brief and of little value as a guide in setting up long-time policies. Researches which provide reliable information about climatic conditions through longer periods are of the very greatest importance in wise planning.

The Study of Tree-Rings

The method used in dendrochronology (the study of tree-rings) is to select trees that are isolated from the chance of stored water below. Trees growing on sheer canyon slopes, or on flat-topped mesas, are selected. In these locations the moisture available is limited to rainfall. The thickness of the growth rings is measured in a number of trees taken from the same location. By comparisons, these provide the general tree-ring pattern of the area.

The rings of growth during the more recent years when careful rainfall records have been kept are then compared to check the accuracy of the samplings. Studies throughout the southwestern United States have shown very close relationships between the growth of the rings and the rainfall of known periods, and this warrants the conclusion that when the trees to be studied are carefully selected as to location, they will give a true picture of the rainfall of the years past. Studies of living trees and of trees found in prehistoric pueblo areas have made possible excellent rainfall records for Arizona, New Mexico, Colorado, and Utah back to the year 11 A. D.

There is pressing need for determination of climatic records through such studies of the growth of trees for the entire hemisphere. The climatic history of these areas for the thousands of years past is a fundamental requisite if sound agricultural policies for the hemisphere are to be set up.

People in some areas are inclined to do much wishful thinking about climatic changes. In areas where drouth is a great problem, they like to believe that rainfall is gradually increasing and in areas where too much rain falls, they like to believe that it is decreasing. The records established by the dendrochronologists, running back through the Christian era, seem to demonstrate rather definitely that the rainfall pattern of centuries past and the rainfall pattern of modern times have changed relatively very little. The records support the existence of climatic cycles of drouth and rainfall, but the basic climatic conditions do not permanently change.

Anthropology as an Aid

Modern researches in anthropology have contributed much to the understanding of man in relation to his environment. Prior to comparatively recent years, anthropologists, especially those in the field of archaeology, were concerned primarily with the collection of specimens. These workers rendered an important service in locating the areas and materials which have made later studies possible.

Modern archaeologists still collect specimens but in order that they may reconstruct the pattern of, and study man's responses to, the conditions under which he lived. The most recent procedures in research in this field have enabled them to contribute information of great value in relation to the establishment of agricultural policies.

Archaeological studies clearly show that the early residents of the southwestern region of the United States were hunters. Going back to the Folsom culture, immediately following the last glacial advance from ten to twenty thousand years ago, and continuing to the opening of the Christian era, food was secured chiefly by hunting.

Upwards of 2,000 years ago, food-getters began to include plants as well as animals in their diet. Stone milling implements of this period show that the grinding of food plants was an established practice.

The food-getting economy prepared the way for agriculture. At some time in the past (not accurately established yet) and in some place in Central or South America, experiments with plants led to the domestication of corn, beans, and squash. These products spread to North America. Closely linked with this was the development of irrigation which made possible a high level of culture and the establishment of villages in the cultivated areas.

Studies of other early conditions in the Southwest show how the ancient Indians of that region turned events to their own agricultural advantage. A good example is found in the region near Flagstaff, Ariz. There the eruption of Sunset Crater in the early ninth century, A. D., covered a large area with layers of volcanic ash. This formed a mulch conserving the moisture in the area and greatly increasing the productivity of the soil. Very quickly the agricultural pueblo Indians discovered this, and the area became thickly settled.

Research in the field of plant ecology has yielded findings of most fundamental significance to those who have to do with making agricultural policy. Ecologists

deal with the relationships of organisms to their environments and the balances established under these relationships.

For those who would introduce new plant forms into areas of climatic peculiarities and limitations, it is important to study products and types in parallel areas. In the United States, some of the most important crops now grown in the Southwest were imported—grain sorghums from North Africa, dates from Arabia, olives from Palestine, citrus fruits from Persia and South China.

Plant explorers associated with the United States Department of Agriculture are familiar with the ecological conditions prevailing in the areas for which plants are being sought, and they study the ecological conditions in the sections and countries to which they go. If crops are to be established and grown with dependability, the balance must be maintained between the plant and the conditions under which it grows.

It should be remembered that plants which survive under particular conditions build up resistance to the diseases which prevail there. All too frequently, efforts to introduce new plant types have been frustrated by the susceptibility of the introduced plants to diseases to which they have not been previously exposed. Survival is the very best assurance that a plant can resist its most prevalent enemies. Ecological studies have much to contribute in making policies for enduring agricultural production in different sections of the continents.

Scientists and agriculturists have long since demonstrated their ability to modify plants so as to adapt them to new environments through selection, hybridization, and improvement by breeding. The rediscovery of the Mendelian laws less than half a century ago made possible the establishment of dependable procedures in plant improvement, and since that time plant adaptations have gone forward with greater certainty and rapidity. The plant physiologist and breeder have much to offer to guide those who make agricultural policy.

Modification of Environment

Man is also able to modify the environment, to better meet the needs of plants. Through irrigation he can supplement moisture supplies. Through more appropriate methods of tillage, crop sequences and in other ways he can improve soil adaptations and eliminate competition from other plants. While natural environment has a most important influence in determining the range of crops which may be grown in a given area, there are many adjustments which man may make to modify to a great extent these environmental influences.

While dendrochronology, anthropology, and ecology have much to offer to the planners of agricultural policy, these are all long-range sciences in which there must be a considerable lapse of time between the initial changes and the established results of those changes. Periods of hundreds of years must be studied to disclose the trends of climates, as revealed by the records of tree-growth. Centuries of man's development must be uncovered and studied before the lessons of early man's successful adaptations to environment, and the results of his unsuccessful attempts, may be made available for present-day guidance in planning. Ecological changes are not quite so slow, but even in that science years must often elapse before successful adaptations can be proved in the field. There is one new field of study, however, that has brought proof of its effectiveness in the short space of a single decade. This is land-use planning.

Land-Use Planning

In the broad program of conservation in the United States, depleted agriculture has been revitalized by new seedings of soil-conserving crops such as grasses, legumes, and trees; by the application of limestone, superphosphate, and manures. Much progress has been made in restoring eroded lands through terracing, contour furrowing, summer fallowing, strip cropping, and construction of check dams. On the range lands of the West, land-use programs have resulted in restoring native grasses, through reduction of the numbers of animal feeding units to protect the ranges, and in some cases through reseeding.

Out of this planning for wise land-use has grown a program for Government purchase and development of submarginal land. This program has resulted in the extension of farm forestry and in turning certain lands not well suited for cultivated agriculture into wildlife refuges. Land-use planning in the West has included water-use planning, too. Considerable progress has been made in the conservation and effective use of limited water supplies in many of the Western States.

As a result of the land-use program in the United States, much soil fertility will be saved to coming generations and many of the disastrous results of careless use of irrigation water and careless handling of rain run-off, overcropping and overgrazing, will be avoided.

It is generally accepted that land policy should be such as to guide us toward a use of land in ways that will provide the highest possible level of living for all the people. Land policies should contribute toward security for the farm home, adequate and stable incomes for farm families, and a continuous and abundant supply of farm products for all the people. Further, it is generally agreed that lands should be used only in ways that will maintain their productivity throughout the succeeding generations. The leaders of the new agrarian reforms now under way in Mexico announce the same objectives. Other American nations may well be thinking along similar lines.

CAMERA HIGHLIGHTS

More than 300 photographs from 18 American Republics comprised the entries to the Inter-American Photographic Exhibit held at the Pan American Union from January 6 to 23. Chosen in national competitions conducted in the respective countries, they were judged by a jury of noted photographers and art critics; the Gold Seal of the Pan American Union was awarded to the outstanding entry from each American Republic.

Some of the entries which referred to land, settlement, or agriculture are reproduced on this and the following page.

"Country" (prize-winning photograph for Panamá), by J. F. Flatau.

"Jiboa Valley" (El Salvador), by Alfredo Joseph.

"Paradise Lost" (Perú), by Bennet Grieg.

"Transportation" (Haiti), by Édouard Peloux.

"Ombú Tree" (Uruguay), by Carlos Pobuda.

Quaint, winding roads are typical of rural Panamá.

The extensive, fertile, and highly picturesque valley of the Jiboa river lies at the foot of San Vicente volcano.

High in the Andean mountains rest ruins of a lost Indian civilization.

Primitive methods of transportation still obtain in many Latin American countries.

The ombú tree, while useless as wood, nevertheless furnishes welcome shade on the Argentine and Uruguayan plains. It also serves as landmark to the gaucho riding across the pampa.

Clustered in Ecuador are some 30 active volcanoes, some of them among the largest in the world. The highest of these peaks is Mt. Chimborazo (20,574 ft.). At night the clouds which swirl around its summit are lighted by the reflection of the molten lava in the crater. The intermont basins, originally covered with a dense growth of brush, are now gently rolling, grassy plateaus, for much of the brush has been cut to make charcoal or burned to provide more room for pasture.

"Chimborazo" (Ecuador), by Bodo Wuth.

Venezuela—Cradle of Americanism

Birthplace of the great Liberator, Simón Bolívar, Venezuela has a long tradition of cooperation with the United States in the common pursuit of an ideal fraternity of American nations.

by PHILIP LEONARD GREEN

Venezuela means "Little Venice." And so it was named by the Spanish explorer, Alonso de Ojeda, when he saw the native huts standing on stilts at the water's edge as he approached the land in 1499.

During colonial times, Spain never maintained large concentrations of power in this section of her great empire, for Venezuela seemed to have little to offer in mineral wealth. Spanish attention was fixed on the rich silver mines of Mexico and Peru; Spanish armed forces implemented that attention. So it was that the first sizeable uprisings in behalf of South American independence took place in Venezuela. And it was the immortal Venezuelan Simón Bolívar, Liberator of five American nations, who, even in the heat of the struggle for freedom, planned for the inter-American friendship and cooperation which today are becoming reality. In the years following her separation from Spain, Venezuela suffered from internal dissensions, but to a large extent the nation's leaders never lost sight of Bolívar's Pan American dream.

Venezuela is a land of 352,000 square miles—roughly, the combined size of Texas and Colorado.

Over 3,500,000 people make up the Venezuelan nation. Of these, 7 percent are pure Indians, who live largely in the remote interior regions; 8 percent are pure Negroes, settled mainly along the Caribbean coast; and 15 percent are of European extraction, predominantly Spanish. The other 70 percent are people whose ancestors were members of two or more of these races. As in other Spanish American republics, the people of Indian and Spanish origin are known as *mestizos;* those of Spanish and Negro blood are called *mulatos;* and those of Negro and Indian descent are classed as *zambos*. At the Venezuelan Embassy in Washington, there is a mural which depicts superb types of all three and symbolizes their brotherhood. The descendants of the old Spanish families comprise the aristocracy of Venezuela.

Venezuela, which has almost every known climate, may be roughly divided into four parts. First is the coastal region seen by a visitor approaching the country

Courtesy of Pan American Airways System

La Guaira, the main port of Venezuela, and the point of entry for Caracas.

Caracas—capital of Venezuela—is located in the valley of the same name, 3,000 feet up in the Central Highlands.

by sea. Here are located the nation's seaports and the rich agricultural valleys of Caracas and Valencia. Busy cities, large haciendas, sleepy colonial towns, excellent modern roads—all may be found in this region.

Then there are the mountainous or Andean regions, which support a considerable part of the population and offer a variety of mineral products as well. The Guiana highlands form another region, for which many observers hold forth economic promise as a future source of minerals.

Lastly, there are the vast plains, or llanos. This is the land of the cowboy, or *llanero*. From this region came many of the fighters in the struggle for Independence.

Petroleum accounts for about 90 percent of Venezuelan exports. This "black gold"—so important in world commerce today—is found largely in the Maracaibo Basin, in a region about 75 by 20 miles in extent, which produces over 500,000 barrels a day. As the Government of Venezuela collects a royalty of 12½ percent on all oil exports—about 20,000,000 tons annually—two thirds of governmental revenues come from oil. It has been said that oil supports the Government, but agriculture feeds the people.

A number of public men in Venezuela have long realized the need for promoting agricultural development. They deplore the fact that Venezuelans have become so interested in the oil business that such basic food items as beans, potatoes, and rice have to be imported from other countries. The Government is now encouraging agriculture and stock raising.

At present, however, there are a number of difficulties in the way of agricultural development. Soil erosion, which has taken a tremendous toll, is one, as indicated by the recent survey conducted by Dr. H. H. Bennett, Chief of the Soil Conservation Service of the United States Department of Agriculture. Then there are the high wages paid by the oil industry. When more and more workers are drawn from the farms, less and less food crops are grown. Prices for daily necessities, already high, spiral still farther. That a favorable trade balance alone does not guarantee a nation's material well-being, is coming to be realized more and more by the Venezuelan authorities.

At the present time, coffee constitutes only 3 percent of the country's exports by value and cacao only 1 percent. These and other crops could be expanded and new products introduced through scientific methods.

Well-planned progress toward a more diversified economy is the concern of the country's leaders today. Through labor and industrial banks, funds have been made available to help people who wish to settle on the land as farmers. Bounties have been established for increased production of necessary food crops. There has been a marked expansion in the use of water power. Transportation facilities have been improved. The road between Caracas and its port, La Guaira, for instance,

Interior of a typical sugar mill.

was one of the first all-concrete arteries in Latin America. Today most of Venezuela's important towns are connected by roads. The port works at La Guaira and Puerto Cabello are also notable.

Venezuela's mineral wealth, too, has hardly been tapped. Gold, silver, copper, iron, tin, asphalt, asbestos, and mica are some of the products that could be made to yield more revenues for the country. Some of these are already being exploited.

The country has also forged ahead in many spheres of social betterment. Venezuelan social and labor laws are considered to be among the most advanced in the Western Hemisphere. The 8-hour day and 48-hour week (40 hours for office workers), collective bargaining, and minimum wages are provided by law. Employees who are discharged after a year's service are entitled to receive a month's notice. A profit-sharing plan has been established, too. Health centers have been set up. Modern homes for workmen have been built.

Three hundred new public schools have been opened within recent years to serve populous centers. School trailers are being sent to districts where children might otherwise have to go without learning.

Encouragement of education and culture has long been characteristic of Venezuela. As early as 1725, Caracas had its university. Andrés Bello, one of the fathers of Chilean education and the author of a well-known Spanish grammar, was Venezuelan by birth. Teresa Carreño was a pianist who played with outstanding success before European audiences. Martín Tovar y Tovar is a noted painter. The famous botanist, Henry Pittier, formerly associated with the United States Department of Agriculture, is an adopted son of Venezuela. Many others notable in arts and letters could be mentioned.

The present war, in which almost the entire world is engulfed, finds Venezuela standing solidly with her neighbors in the Americas. Venezuela seized Axis ships at the same time as the United States. On October 16, 1942, she signed an agreement with the United States, under the terms of which this country was to receive all rubber produced in Venezuela and not required for domestic use. Three years before, the two Republics had already signed a reciprocal trade agreement designed to promote the exchange of products between them. On the other hand, the United States, through the Export-Import Bank, set aside a credit of $3,600,000 to help in strengthening the economy of Venezuela during the period of adjustment; $20,000,000 to be used for public works; and $12,000,000 for the Banco Agrícola y Pecuario. A $15,000,000 credit has also been extended under Lend-Lease.

The record of cooperation between Venezuela and the United States is not one limited to the present emergency. It has been a tradition. Bolívar himself spent some time in the United States and often expressed his admiration for this country. The statues of Washington and of Henry Clay, that father of United States cooperation with other American Republics, today bear witness in Caracas to the vigorous friendship that has ever bound the two countries together in united service to the inter-American ideals of Simón Bolívar.

A Venezuelan farmer brings peppers and onions to market.

Trade Agreement With Mexico

by KATHRYN H. WYLIE

The reciprocal trade agreement between the United States and Mexico, which came into effect on January 30, climaxes a series of understandings between the two countries. These understandings go a long way toward correcting the differences about boundaries, agrarian claims, and expropriation of foreign-owned properties in Mexico that have blocked complete cooperation between the two countries. The trade agreement now concluded is a positive effort to break down barriers which have prevented the free flow of trade.

This agreement was signed by the Honorable Cordell Hull, Secretary of State of the United States, and His Excellency, Dr. don Francisco Castillo Nájera, Ambassador of Mexico, on December 23. It will remain in effect for 3 years, unless terminated earlier under specified conditions, and thereafter it will be subject to termination on 6-months notice by either Government.

The United States and Mexico each grant reciprocal tariff concessions on their imports from the other and give general assurances of non-discriminatory trade treatment. The concessions are in the form of reductions in tariff duties, and in assurances that certain other duties will not be increased and that a number of products now on the free list will continue to enter duty free.

Negotiation of the trade agreement was closely tied up with the settlement of property differences between the Mexican Government and United States citizens, which came to a head in the oil expropriations of March 1938. After a series of proposals and counter proposals by both parties, a friendly settlement of these differences was assured on November 19, 1941. A significant part of this understanding was the provision to negotiate a trade agreement between the two countries.

The trade agreement that has now been concluded is designed to facilitate wartime interchange of goods, and in addition, to encourage an even larger trade after the war than has taken place in the past. For many decades Mexico and the United States have traded with each other. In 1939 the total value of this trade was $139,443,000, rising to $172,721,000 in 1940. Taking from 47 to 90 percent of all Mexican exports (value) and supplying from 60 to 80 percent of Mexican imports, the United States is the most important country in Mexican trade. Mexico on the other hand is one of the first three Latin American markets for United States exports; in some years it takes the lead. The value of United States imports from and exports to Mexico has risen sharply since the outbreak of the war late in 1939.

Precious metals are the largest United States imports from Mexico (value), accounting for more than half the total in the 3-year period, 1938–40. Other imports, however, covered a wide range of commodities—foods, fibers, petroleum, and manufactured products. Following gold and silver, copper for refining and export was the largest single import, but bananas and cattle followed closely, together accounting for 9 percent of total imports and 19 percent of imports for consumption.

Machinery and vehicles are the most valuable United States exports to Mexico. They accounted for 39 percent of the value in the 1938–40 period; metals and metal manufactures, for another 17 percent; while chemicals, wood and paper, food, nonmetallic minerals, and textiles accounted for the remaining 45 percent.

Important agricultural imports into the United States from Mexico include bananas, cattle, coffee, chicle, henequen, guayule rubber, hides and skins, feedstuffs, and fresh vegetables. For most of these products the United States is Mexico's best market. Mexico needs certain agricultural products in return, particularly fats and oils, condensed and evaporated milk, cigarettes and certain types of tobacco, and wheat and corn in years of low yields. For most of these the United States is the principal supplier, furnishing from 50 to 100 percent of total Mexican imports.

Although most United States exports to Mexico usually are of manufactured and processed commodities and imports from Mexico are largely of raw materials, many concessions contained in both Schedule 1 (covering United States imports into Mexico) and Schedule 2 (covering Mexican imports into the United States) are on agricultural products. Mexico reduces or binds its existing duty on 49 agricultural products and binds 1 other on the free list, while the United States reduces or binds its existing duty on 27 agricultural products and binds 15 more on the free list.

Concessions Granted

Mexico grants concessions to the United States on many agricultural items needed in its economy—lard, dried and fresh fruits, barley and barley malt, hops, cottonseed, tobacco, and wheat. The Mexican duty on lard is reduced in the agreement by 22 percent. Mexico is one of the most important Latin American markets for United States lard. Exports of lard to Mexico tripled between 1938 and 1940; after the war they may be expected to expand again.

Before the agreement the specific Mexican duties on

dried and fresh fruits were high in relation to the value of the product. The agreement now reduces the rate on raisins by more than a third, on prunes by one-half, and on sliced dried fruit by three-fourths. Duty reductions on fresh fruit are 14 percent on apples, and 29 percent on plums, peaches, pears, grapes, and fresh fruit not specified. Mexico produces little dried fruit itself but depends on the United States for most of its supplies. Imports of fresh fruit, however, supply considerably less than a tenth of total consumption.

The duty on hops, cottonseed, barley grain, and wheat—all valuable imports from the United States—is reduced by 25 to 40 percent. Other reductions range from a 13 percent cut on Virginia type tobacco to a 33.3 percent reduction on hulled oats and onions. Existing duties are bound on a number of meat products, fresh eggs, evaporated milk, butter, cheddar cheese, stearic acid in cakes, tanned hides, tomato sauce, canned tomatoes, canned fruits, unhulled oats, barley malt, tobacco, and fruit juices.

The most important agricultural items from a trade standpoint on which the United States grants duty reductions to Mexico are cattle, fresh fruits, and vegetables. The following important imports are bound on the free list: bananas, coffee, crude guayule rubber, broomroot, henequen and sisal, tampico fiber, crude chicle, horses or mules for immediate slaughter, breeding cattle, sarsaparilla root, lime oil, lignaloe or bois de rose, pimento (allspice), anise, and candelilla wax.

The United States import duty on all weights of cattle is reduced in the agreement to 1.5 cents a pound without quantitative restrictions during the national emergency. Thereafter, quota restrictions at the reduced rate will again be imposed in the case of calves (cattle weighing under 200 pounds) to 100,000 head a year, and in the case of heavy cattle (those weighing more than 700 pounds) to 225,000 head. In addition, a quota of 400,000 head a year will be placed on the importation of feeder cattle (those weighing between 200 and 700 pounds). This is the class of cattle that has been most important in our trade with Mexico. Imports in excess of the quota in all weights will be dutiable at 2.5 cents a pound.

The general duty on fresh tomatoes is reduced during the emergency from 3 cents to 1.5 cents a pound. Thereafter the general duty will automatically be increased to 2¼ cents a pound. Cuba receives a rate of 20 percent below the general duty in both periods. Tomato imports are almost entirely from Mexico and Cuba.

Duty reductions ranging from a third to one-half are made on beans (green or unripe other than limas), black-eye cowpeas (dried or in brine), green peas, dried chickpeas or garbanzos, fresh peppers, and squash. Seasonal reductions are made on green lima beans, fresh eggplant and fresh cucumbers, and the existing duty on each of these products is bound against increase for the balance of the year. The United States duty is reduced also on fresh pineapples in bulk, limes, mangoes, watermelons, and edible berries (except blueberries). The existing duties on pineapples in crates, preserved and prepared guavas, vanilla beans, honey, mixed feeds, and horses valued at not more than $150 are bound against increase. Duty is cut in half on sheep and lambs, live asses and burros, mules valued at not more than $150, dried blood albumen, and citrus fruit juice unfit for beverage purposes.

An appraisal of the agricultural portion of the agreement can be made on the basis of 1939 trade. The value of United States imports from Mexico in 1939 of principal farm products on which the existing duty is reduced or bound against increase was $8,030,000. Of this amount, however, $4,697,000 was the value of imports of feeder cattle needed by United States farmers and ranchmen for stocking and feeding purposes. The value of imports from Mexico in 1939 of more or less noncompetitive farm products bound on the free list was $20,006,000. The value of Mexican imports from the United States in 1939 of principal agricultural items on which the existing Mexican duty is reduced or bound against increase was $3,924,000, and the import value of agricultural items bound on the free list was $146,000.

Mexico is the fifteenth Latin American country to sign a trade agreement with the United States, leaving only five other Republics in the Western Hemisphere with which agreements have not been concluded.

Signing the Reciprocal Trade Agreement between Mexico and the United States. (Front, left to right), Dr. don Francisco Castillo Nájera, Mexican Ambassador to the United States; Secretary of State, Cordell Hull. Standing, left to right, Don Salvador Duhart, First Secretary of the Mexican Embassy; Charles Barnes, Chief of the Treaty Department of the State Department; and Don Roberto Cordova, Legal Advisor to the Mexican Embassy.

ALONG THE *Agricultural Front*

▲ Chilean Plywood Production

Although a second factory was scheduled to begin operations early in 1943, in 1942 the only company in Chile engaged in the manufacture of plywood was Mosso y Compañía Limitada. Organized in 1936 by three brothers of the Mosso family, this company is a privately owned enterprise with an invested capital of 90 million pesos, including the value of land, factory, and equipment. The property owned is in excess of 100,000 acres, with a timber supply estimated to be sufficient for 70 years. This timber, from which the entire output of plywood is fabricated, consists principally of two species of wood—the Araucaria pine tree and the Coigüe tree. Road construction from the factory into the mountains has been completed at a cost of 6 million pesos. The factory is located at Cura-Cautín (near Temuco), on a spur of the Southern Section of the Chilean State Railways.

Operation of the plant commenced in 1938. Since 1942, the factory has been operating 24 hours a day and employs 1,200 persons. Plant equipment is of modern design and sufficient in quantity to meet present requirements. Argentine plastics are used exclusively in the manufacture.

The annual production of 12,000 cubic meters, or approximately 10,000 metric tons, is valued at 60 million pesos. This production involves complete fabrication of three grades of plywood and is sufficient to meet the entire needs of the country and to permit a surplus for export. Principal exports are to Argentina, and large stocks are maintained for retail distribution throughout Chile.

The second plywood factory is located at Osorno in the province of Valdivia. Erected under the auspices of the Agricultural Colonization Institute and the Development Corporation at an estimated cost of 7 million pesos, it will be operated by the firm of "Somasur." Planned production will be on the basis of 1,000 cubic meters a year for the first 8 months of operation and 2,000 cubic meters per year thereafter, as compared with the annual 12,000 cubic-meters capacity production of Mosso Brothers. In conjunction with the plywood factory, it is understood that "Somasur" will undertake the establishment of an industry for the prefabrication of houses.

▲ New Meteorological Courses Offered in Colombia

Under plans worked out by the United States Weather Bureau, the Office of Inter-American Affairs, the Department of State, and the Defense Supplies Corporation, some 200 students from all the American Republics will be given special training in meteorology. The initial courses were scheduled to start at Medellín, Colombia, on February 1, 1943. On completion of this 6-months course, a number of the honor students will be brought to the United States for an additional year of training, under present plans. This training in the United States would consist of 9 months of study at one of the five major universities in this country specializing in meteorology; on completion of the course in the United States, the students would be assigned to 2 months of active duty with the United States Weather Bureau, as additional training before their return to their home lands.

The initial 200 students were chosen on the basis of four competitive examinations covering English comprehension, language aptitude, mathematics and physics, and aptitude relating to meteorological work.

▲ Y. M. C. A. Agricultural Center Inaugurated in Mexico

The first Y. M. C. A. Rural Reconstruction Center in Mexico has been officially inaugurated at Camohmila, near the primitive Indian village of Tepoztlán, in the State of Morelos. It is about 60 miles south of Mexico City.

The main aim of this rural center is to contribute in the Mexican Government's policy of raising the living standards of the Indian. Y. M. C. A. men from the cosmopolitan area will render volunteer service during the week ends by demonstrating methods of modern living to the Indians. They will stress hygienic conditions, such as ventilation, light, sleeping, eating, and bathing facilities in accordance with the financial means of the community. It is planned to train at Camohmila native leaders in these activities, who later may go to other rural communities to spread the knowledge they have acquired.

Located on an 18-acre tract, this 50,000-peso project includes a spacious community center and dining room building, several stands for agricultural and livestock expositions, laboratory and clinic facilities, an administration building and living quarters for employees and visiting Association members.

Dr. D. Spencer Hatch was assigned to establish the institute at Camohmila for the training of local leaders. The first Mexican to avail himself of this opportunity was Artemio Carranza, nephew of the late President of Mexico, Venustiano Carranza, who will become the first Director of the Camohmila rural enterprise upon Mr. Hatch's return to the United States.

▲ Second Argentine Agronomic Conference

With meetings scheduled from April 5 to 10 in Córdoba, Argentina, the Argentine Agronomic Society has announced as its official topic of discussion the "Diversification of agricultural production in Argentina."

Four sections will be devoted, respectively, to plant production, animal production, crop and livestock industries, and the history of American agriculture. The five interesting subdivisions for the discussion of this last section are: History of botany and agronomy; American agriculture in pre-Hispanic and Colonial times; History of the introduction of useful plants and animals and their enemies; History of the institutions and of the methods and principles related to Argentine crop and livestock progress; Biographies and bibliographies related to the history of agriculture.

For further information about the meetings, address the Comisión Organizadora de la Segunda Reunión Argentina de Agronomía, Sociedad Argentina de Agronomía, Santa Fe 1145, Buenos Aires, República Argentina.

▲ Amazon Valley Agricultural Colony

The State of Pará has granted some 740,000 acres of land to the Federal Government for the purpose of developing agriculture in the lower Amazon Valley. Located near the municipal seat of Monte Alegre, some 450 miles from the city of Pará, the immense tract of land comprises three-fourths of a former Japanese concession, cancelled by a State decree on April 17, 1942. It adjoins an existing federal agricultural project known as the "Nucleo Inglez de Souza."

Dr. Paulo Albuquerque, formerly the state director of the federal agricultural agency, Economia Rural, will direct the agricultural activities in the new concession as well as in the Nucleo Inglez de Souza.

Special attention will be given to the production of such products as rice, corn, beans, sugar cane, cotton, jute, and livestock. Plans also include the operation of a small sawmill and a tile factory, to furnish materials for use in building homes for the colonists.

▲ New Technical Agricultural Service

The Government of Paraguay and the Institute of Inter-American Affairs have agreed upon the establishment of a new Inter-American Technical Service of Agricultural Cooperation.

Established in the Ministry of Agriculture, Commerce and Industry, the new Service will function as a special entity, directly subordinate to the Ministry. Working with such other administrative agencies of the Government related to agricultural and industrial problems as the Departments of Agriculture and Livestock, the General Office of Agricultural Instruction, the Agricultural Bank of Paraguay, the Bureau of Land and Colonization, and the Central Laboratory, the new Service will act as liaison between the Government of Paraguay and the Institute of Inter-American Affairs. The Director will be elected by the Institute and approved by the Paraguayan Ministry of Agriculture, Commerce, and Industry.

The fundamental purpose of the Service will be the solution of the basic food and agricultural problems of Paraguay. It will cooperate in the permanent formation, within the Government of Paraguay, of the personnel and organization necessary for the furtherance of agricultural programs, to increase the self-sufficiency of the country in such matters as agricultural education, increased home production of foods now imported and of crops for sale and export, and a study of such important agricultural problems of the country as maldistribution of population and resources, exhaustion of the land, colonization of new areas.

Signed at Asunción, Paraguay, on December 24, 1942, this agreement is effective for a 2-year period.

AUTHORS in This Issue

Dr. Carl C. Taylor ("Argentina Loves Her Cattle") is now on leave from the Department of Agriculture to serve as Rural Sociologist in the Auxiliary Service of the Department of State. *Philip Leonard Green* ("Venezuela—Cradle of Americanism") is a member of the staff of the Office of Foreign Agricultural Relations in the Department of Agriculture. *Dr. Alfred Atkinson* ("A Land Policy for the Americas") is President of the University of Arizona and a leader in the field of coordinated research as it relates to land use. *Kathryn H. Wylie* ("Trade Agreement with Mexico") is Associate Agricultural Economist in the Office of Foreign Agricultural Relations.

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León DeBayle
OUR MUTUAL FRIEND

Columbus sailed along the eastern shore of Nicaragua as early as 1502, but the most prominent figure in the Spanish conquest of the country was Gil González de Ávila who, 20 years later, treated with its friendly native Indian chief, Nicarao. The Indian capital was situated on the shores of a great "Freshwater Sea," which the Spaniards also called the "Water of Nicarao" or Nicarao-agua, whence the name for their new Spanish colony. First plundering and then settling expeditions came to Nicaragua from Panama, but after the exhaustion of the supply of gold ornaments with which the Indians had welcomed the first comers, Spanish conquistadors lost interest in the peaceful Indian agricultural society, and the main course of Spanish conquest swirled elsewhere. During the colonial period Nicaragua was ruled as part of the captaincy general of Guatemala; she declared her independence from Spain in 1821.

The present Washington representative of this largest of the Central American republics is Dr. León DeBayle. Born in the old city of León in 1902, Dr. DeBayle was educated in his native city at the Colegio San Ramón and the Instituto Nacional de Occidente. Continuing his education in Europe, he was graduated in law and received his doctorate in political science and economics from the Law School of the University of Paris. He also obtained a diploma from the École Libre de Sciences Politiques.

Dr. DeBayle began his distinguished legal and diplomatic career upon his return to Nicaragua in 1928. During 1928 and 1929 he held the office of judge in the civil courts of the District of León; in 1929 he was appointed secretary of the special diplomatic mission sent by his Government to Guatemala and El Salvador; from 1930 to 1934 he practiced law in Managua; in 1935 and 1936 he was Assistant Secretary of the Interior and chief of the legal staff and counselor of the National Bank of Nicaragua; in January 1937 he was one of several jurists appointed to serve on the Codification Commission established by the President of the Republic as a consultative body on legal matters. Also, Dr. DeBayle has taught for several years in the Law School in Managua, and he is the author of many studies on juridical and economic subjects.

Dr. DeBayle belongs to one of the most notable families of Nicaragua. His father, Dr. Luis H. DeBayle, was a distinguished physician of French descent and a well-known writer of poetry and philosophical essays. Dr. León DeBayle's mother was the sister of a former President of Nicaragua; his three brothers—two of whom are physicians—have, like Dr. León DeBayle, served their country in diplomacy and politics; one of his sisters is the wife of the present President of Nicaragua. Dr. DeBayle is noted for his keen analytical mind, his sense of humor, and his personal charm.

BOLIVIA

Land

Although the area of Bolivia has never been accurately determined, it has been estimated at some 416,000 square miles, more than one and a half times the size of Texas.

Bolivia is a landlocked country with three distinct topographical and climatic divisions. The first consists of the high plateau region to the west and averages over 12,000 feet in elevation. The second division, usually called the *montaña*, contains the valleys which slope down from the plateau to the eastern lowlands. The valleys in the abrupt northern face of the eastern range, called the Cordillera Oriental, receive a very high rainfall. They are known as the *yungas*, and are heavily forested except for a few important cultivated areas. The third division includes the tropical lowlands—pampa and jungle swampland to the north, and the Chaco to the south.

Climate

Although Bolivia lies entirely within the Tropics, it possesses every gradation of climate from the heat of the equatorial lowlands to the Arctic cold of the Andean regions. Temperature is inversely proportionate to altitude.

Population

The last census of Bolivia—that of 1900—gave the population of Bolivia at 1,816,000. Present estimates range around 3,400,000. According to an official estimate, more than one-half of the population is Indian, nearly one-third is of mixed races, and about one-eighth is of European descent.

Agriculture

Approximately two-thirds of the Bolivians live on the land and depend upon it for all, or a large part, of what they eat. Agriculture, however, is largely carried on under primitive conditions, and there is not enough domestic production to feed the people who live in the cities or work in the mines. Paradoxically, Bolivia — though an agricultural country—has to import food for its people.

Among the principal agricultural products of Bolivia are wheat, rice, barley, potatoes, coffee, cacao, sugar cane, coca (the plant that contains the drug cocaine), cinchona bark (the source of quinine), and quinua (a small grain made into meal or gruel for native consumption). Other products are fruits, corn, yuca, ocas, beans, onions, peas, tobacco, and sweet potatoes. Bolivia has ranked high, after Brazil, as a rubber-exporting country of South America.

Bolivia's principal agricultural imports are wheat, flour, rice, sugar, cotton and wool (raw and manufactured), livestock, meats, dairy products, edible fats and oils, barley, and lumber. While about nine-tenths of the total exports are minerals, among agricultural exports are Brazil nuts, cinchona bark, hides and skins, rubber, and coca.

Stockraising is of considerable importance in Bolivia.

Forests

North and east of the more developed Andean mining districts, spreads a vast frontier country, made up largely of the plains and jungles of the Amazon and other river systems. These areas are rich in all sorts of timber which await an exploitation largely dependent upon transportation development.

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IN THIS ISSUE

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NAMES & NEWS

Dr. Earl N. Bressman has left for Turrialba, Costa Rica, to take charge of the field headquarters of the Inter-American Institute of Agricultural Sciences. As Director, Dr. Bressman will accept officially the transfer of the properties offered to the Institute by the Costa Rican Government. He will remain an indefinite period of time in Costa Rica, to supervise the building program and undertake any field work that can be initiated at the present.

The Washington headquarters of the Institute are in charge of *José L. Colom,* at the Division of Agricultural Cooperation in the Pan American Union. Mr. Colom is the Secretary of the Institute.

José L. Colom has returned from Colombia, Costa Rica, and Honduras. One of the objectives of the trip to Colombia, which was at the invitation of the Government of the Departmento del Valle del Cauca, was to advise on the agricultural development of the region and the production of foodstuffs to ship to the Canal Zone in Panama. In Costa Rica Mr. Colom visited the site for the Inter-American Institute of Agricultural Sciences, which is being organized in Turrialba. In Honduras he conferred with *Dr. Wilson Popenoe* at the Pan American Agricultural School established at Zamorano, Honduras. This school will probably be open in June, with 50 students from the Central and South American Republics. The building program is well advanced, with one of the dormitories and four of the residences for the staff already completed.

John Plauché, formerly with the Banco Atlántida in Honduras and the Banco Urquijo in Spain and recently with the exporting firm of Smith, Kirkpatrick & Co. of New York, has left for Quito, Ecuador, to serve as Assistant General Manager of the Corporación Ecuatoriana de Fomento. The General Manager of this Corporation is *Edward Kinnear,* formerly with the Office of Foreign Agricultural Relations in the United States Department of Agriculture.

David Yale, Director of the Rubber Program of the Corporación Ecuatoriana de Fomento, has consulted with the Rubber Reserve Co. and with the Department of Agriculture, with a view toward the establishment of trading posts in the rubber producing areas of Ecuador. Stocked with foods, clothing and other articles available in Ecuador and supplemented by such merchandise as is required from the United States, these posts would serve as centers for the procurement of rubber and offer a possible stimulus to increased local collections.

Brazilian Visitor

Dr. José Britto Pinheiro dos Passos, of Pernambuco, has come to the United States on an official mission for the Brazilian Ministry of Agriculture. Dr. Passos is Technical Director of the Usina Catende, one of the largest sugar mills in Brazil. He is particularly interested in the manufacture of cellulose and cellulose products from sugar cane and in the manufacture of industrial alcohol from molasses and corn. Dr. Passos has conferred with *Carl F. Speh* of the Bureau of Agricultural Chemistry and Engineering in Washington, and he has visited the regional laboratories of the Department of Agriculture at New Orleans and Peoria.

(*See page 79*)

Agriculture IN THE *Americas*

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"Good Neighbor" Flowers

Many a flower now common in our North American gardens is an immigrant from the other American Republics to the South. Petunias, four-o'clocks, nasturtiums, verbenas, zinnias, and cosmos are among the many blossoms to have become welcome additions to our garden world.

by C. O. ERLANSON
and B. Y. MORRISON

When an American gardener plants his heavy-scented petunias, his four-o'clocks, nasturtiums, zinnias and cosmos, he is welcoming some of America's early "Good Neighbors," for, like many other plants, these common garden annuals came to us from our sister American Republics many years ago.

Yet it is a far cry from the modern petunia, say, with its innumerable forms, colors, patterns, and habits of growth, to the plants depicted in such early records as Curtis' *Botanical Magazine* or Lindley's *Botanical Register*.

In the former, the editor writes of *Petunia violacea:* "This new and most distinct species of Salpiglossis (genuine salpiglossis were known before petunias and were once considered to embrace the genus petunia—Aut.) was raised from seeds sent in the autumn of 1830, by Mr. Tweedy of Buenos Ayres, to the Glasgow Botanic Garden. . . . It promises to be a most valuable addition to our semi-hardy plants, but whether as an annual or otherwise, I am not in position to say. I have specimens of the plant sent to me by Mr. James Baird of Buenos Ayres, who gathered them upon the Uruguay, near the Río Negro. . . . From the same source and from the same country I possess another species of Salpiglossis, which may be named and distinguished: *S. linearis.*"

Lindley's plate and note which appeared in 1833 add little to the data save "a native of Buenos Ayres, and like other herbaceous plants from the same country, quite hardy in England during the summer; in winter it required protection from frost." Lindley also saw clearly that the plant was a petunia and neither a salpiglossis nor a nierembergia!

Graham, writing in the *Botanical Magazine* in 1828, wrote in part—"It first flowered in the garden of Mr. Neill, Cannon Mills, Edinburgh, from seeds sent by Dr. Gillies. . . . Both the species have flowered freely in the stove of the Royal Botanic Garden, Edinburgh in September, and will continue to do so during October, the seeds having been sent from the Cordillera, by Mr. Cruikshanks in 1826." The plants are now known to be native of Chile, and while there are other species, the one at present common in cultivation bears the name of *S. sinuata.*

Nasturtium. Curtis' *Botanical Magazine.* [1835]

The year 1822 marked the introduction of scarlet sage, a brilliant plant not much in favor at present but still commonly grown. Aside from the notes in the *Botanical Register* (1822), there is little to add here. "Introduced by Mr. Lee from the Brazils into the Hammersmith Nursery (near London—Aut.) where the plant flowers freely in the hothouse and for a long time in succession."

"Recently observed by Prince Maximilian of Wied-Neuwied, and mentioned in his travels by the name we have adopted, but without description. There are native samples collected by Mr. Sello, in Mr. Lambert's Herbarium."

The years 1831 and 1832 brought good illustrations of the beautiful schizanthus, with its hosts of brilliant flowers, which suggest orchids to many persons because of their shape and coloring but are more often thought of as butterflies. "A native of the Andes of Mendoza, whence we have specimens from Dr. Gillies." "In addition to the two species of Schizanthi already given in

most of our botanical publications, two species have lately been raised from seeds brought from Chili by Dr. Gillies, in the present garden of Mrs. Borg, at Porto Bella."

Many pictures and notes about nasturtiums date from the period 1810–50, but the first note of considerable garden importance was that in Curtis' *Botanical Magazine*, to accompany plate 23, in 1787. With the note is a drawing of a vermilion-red form of *Tropaeolum majus*, the prototype of the ordinary garden nasturtium of vining habit.

Four-o'clock. Curtis' *Botanical Magazine.* [1797]

From the text might be cited: "The present plant is a native of Peru, and is said by Linnaeus to have been first brought to Europe in the year 1684." "Elizabeth Christina, one of the daughters of Linnaeus, is said to have perceived the flower to emit spontaneously, at certain intervals, sparks like those of electricity, visible only in the dusk of the evening, and which ceased when total darkness came on."

One wonders about Elizabeth Christina!

With the exception of the species commonly called canary bird creeper (*T. peregrinum*), none of the other species of nasturtium have become common in our gardens. Many of them have long-lived roots that will not tolerate our winter freezes. Reports of success with *T. speciosum* come in from the Pacific Northwest from time to time, but there is always difficulty in finding plants if one wants them. Its name in horticultural history is associated with that of William Lobb, the splendid collector for Messrs. Veitch & Sons of Exeter, England, who have fostered so much horticultural exploration and plant introduction.

Common portulaca also belongs to South America. In the *Botanical Magazine* plate 2885 (1829), the note reports: "It was discovered by Dr. Gillies, growing in the light sandy soil, in various situations between the Río del Saladillo, or western boundary of the Pampas, and the foot of the mountains near Mendoza. On the western side of Río Desaguadero plants were growing in general profusion, giving the ground over which they were spread a rich purple hue, here and there marked with spots of an orange colour, from the orange-coloured variety which grew intermixed with the others."

It should be remembered that there are other South American portulacas but that few have flowers as large or as gay.

Four-o'clocks are romantically known as Marvel-of-Peru. In 1797, Curtis' *Botanical Magazine* says briefly: "From Peru, its original place of growth, this plant was introduced to Europe at a very early date; the names it bore on its introduction sufficiently testify the admiration in which it was held; it was well known to both Gerard and Parkinson."

Of flowering tobaccos there are no end, among the fine plates of both the *Botanical Magazine* and the *Botanical Register*, but it would need a staff of taxonomists, perhaps, to say with authority what names they would bear now. Enough may be said in reminding one of the fact that the genus is American and that the flowering forms have been known for a long time and that the heavy scent which fills the evening air was appreciated then as now.

Of verbenas there is little to say since most of the common garden forms are a mongrel lot with some uncertainty as to the whole story of their hybrid past. The genus itself is American with possibly the greatest number of species South American. From some recent taxonomic papers one might guess that the whole number of possible progenitors has not been collected from Argentina, Chile, and the neighboring States.

The calceolarias also have suffered a similar fate and one can find a querulous note in some of the old papers, from purists who hoped the species might be maintained as they came from South America. The family is a large one with tiny annuals, all sorts of herbaceous perennials, and even shrubby species. Here we rarely see anything save the modern descendents of the biennial forms that are grown for winter greenhouse flowering and are known to many folk as lady's-slipper, a common name used for various other plants as well.

Occasionally one comes upon species in the rock gardens of specialists, and news from the milder climates of the Pacific coast make one wish for similar growing conditions. As it is, we must be content with library pleasures, remembering the years of work of Ruiz and Pavón in Peru, the travels of Humboldt, the infinite journeyings of William Lobb, the "invaluable correspondent, Dr. Gillies, of Mendoza," of Mr. Cruikshanks, who collected in "Chili" and sent his seeds to Edinburgh.

Petunia. Lindley's *Botanical Register.* [1833]

Within the last decade, several nierembergias have come to the fore, but one always recalls

the old and lovely *N. rivularis* named to recall its place of origin. "I have dried specimens from various places near Buenos Aires, where it was discovered by the late Mr. Tweedie upward of 30 years ago. This collection describes it as a most lovely and fragrant plant, abounding by the sides of the Plate River, and only within high-tide mark, its flowers rising above the dwarf grass which grows in similar situations," writes the editor in the *Botanical Magazine* for November 1, 1866.

Wm. Jackson Hooker, writing in the same book in 1831, mentions ". . . a native of Peru (*N. repens* R. & P.) and another of Mexico (*N. angustifolia* HBK.) and a third of Monte Video (*N. pubescens* Spreng.). To these I have the pleasure of adding a fourth, a native, like the last, to the vicinity of Uruguay, but with its botanical character nearly approaching the Mexican plant." One gathers up as well the fragment that "Nierembergia" is "in compliment to John Eusebius Nieremberg, a Spanish Jesuit of the Sixteenth Century who wrote a 'History of Nature.' "

And, last of all, although there are many others, one might choose the late summer to autumn flowering annuals which Linnaeus named Browallia, whose beautiful deep blue to purplish-blue flowers will always recall to mind the tale related in the *Botanical Magazine*.

"Named after John Browall, a Swede, Bishop of Abo in 1743. The intimacy and subsequent rupture between Browall and Linnaeus were commemorated by the latter in the specific appellations which he bestowed on the only three individuals of the Genus then known—*B. elata* expresses the degree of their union, *B. demissa*, its cessation; while the ambiguous name of the third species, *B. alienata*, while it intimates the uncertain characters of the plant, implies also the subsequent difference between the parties."

No study of our American garden plants could close without mention of both zinnia and cosmos, which come to us principally from Mexico, although the yellow cosmos which had such popular acclaim in recent years was introduced not only from Mexico but also from various places in South America where it was cultivated as a garden plant.

If one thinks of the wealth of forms and habits that have arisen since the first seeds came into our garden world, and how happily these plants have become part of our life, what pleasant philosophizing might ensue!

Quebracho Makes Shoes

Latin America has become increasingly important to tanners in the United States because of its wealth of hides and because its quebracho wood is the most important tanning material produced anywhere in the world today.

by S. B. DETWILER

South America is the home of the famous quebracho tree, but North America benefits greatly from the high grade leathers that owe their quality to the rich tannin content of quebracho wood. Rationing of shoes has impressed upon the people of the United States that leather is an imperative necessity for armed forces and civilians alike. In announcing the rationing on February 7, Stabilization Director Byrnes said that it was required because of a limited supply of heavy sole leather. More than one-third of our heavy leather is being used for military and lend-lease purposes. Although domestic hide and skin production is ahead of that of a year ago and the tanners have been successful in furnishing manufacturers with the leather required for filling military orders, not enough remains to satisfy civilian desires. Leather—and tannin—have become important.

The manufacturers of leather have long searched the world for vegetable tanning materials to furnish the tans and tannin extracts required to produce the qualities of leather best fitted for the multiplicity of uses which leathers must serve. Chrome and other mineral tanning chemicals are used to some extent, but the processing of by far the larger proportion of our leathers depends upon tannins from plants.

Latin America has become increasingly important to tanners in the United States because of its wealth of

vegetable tan stuffs and because of its wealth of hides. The United States is today the world's greatest producer of leather and this Nation consumes more quebracho tannin than any other country. Quebracho tannin is especially valuable for sole leather because it rapidly imparts those qualities most essential to durability and satisfactory service of shoe soles.

In the days when the United States still had extensive virgin forests and industrial development was young, there were as many as 5,000 tanneries in the United States. At that time the tanneries were small, the work was all done by slow hand-labor methods, and tannin was obtained locally from the then plentiful supplies of hemlock bark, bark of various oaks, sumac leaves, and other plant species of minor importance. The introduction of machinery and chemical research on tanning processes reduced the time required for tanning from months to days and eliminated much hand labor. About 250 tanneries now produce the major portion of our domestic leather output. Census Bureau figures show that leather and its manufacture accounted for 3.7 percent of the total industrial wages paid in 1935 and produced values that year equal to half the production values of the entire coal and petroleum industry of the United States.

Sixty years ago the sawmills and forest fires had nearly completed their relentless devastation of our virgin forests of northern white pine and hemlock. When the thick-barked hemlocks became less plentiful, our vast forests of native chestnut became the main source of tannic acid. The wood of this tree, as well as the bark, contains an excellent grade of tannin that is readily extracted. During the past year, domestic chestnut extract plants have been operating at full capacity and have done excellently in keeping tanners supplied with the extract. However, the chestnut wood now used for extract comes almost entirely from trees killed by the chestnut blight, an epidemic tree disease caused by a fungus that was brought here from the Orient about a half century ago on Japanese chestnut trees planted for nut orchards. Discovered on Long Island, N. Y., in 1904, this blight has swept north, west, and south, virtually to the commercial limits of the vast native chestnut forests.

When the manufacturers and users of chestnut extract realized, 20 to 30 years ago, that our chestnut was a doomed species, they began to import and use quebracho wood in its place. The tannin from this Latin American tree was used to a limited extent by the tanners of the United States as early as 1902 and was even then greatly valued for the special quality of sole leather it produced. Its use has steadily grown, not only for heavy leather tannage, but through skillful handling, in combination with other tannin extracts, for a great variety of leathers. According to "Statistical Abstract of the United States, 1941", published by the Department of Commerce, the United States used domestic tannin materials in 1939 valued at $11,712,000 and imported additional tannin materials valued at $8,187,000—a total of nearly 20 million dollars worth of tannin materials for that year. Of this, quebracho from Latin America constituted approximately 27 percent of the total tannin values consumed in the United States and 65 percent of the imported tannin values.

In war or peace the United States must have high class sole leather. About 50 percent of our leather production is "heavy leather," of which 85 percent is used in shoe manufacturing for soles and uppers. As a tanning agent quebracho is employed for all classes of

A large red quebracho tree in the western part of the Territory of the Chaco. This tree, if all sound, would yield some 6,000 kilos of wood fit for tannin extraction, producing 5 tons of solid extract, and in addition at least 1,000 kilos of firewood from the limbs.

leather. For sole, belting, and harness leather, it is blended with other tannins, principally chestnut, to produce the most desirable grades of these heavy leathers. When tanned with quebracho alone the leather is too brittle and tends to burn the foot if used for soles. Tannin experts state that quebracho extract is one of the quickest-acting vegetable tans known. This rapid action is especially important now when increased leather production is urgent. It is extensively used by tanners of sheepskin leathers; properly blended, it yields a light leather well adapted to take on all varieties of dyes.

Quebracho extract in the solid form, as commonly manufactured and sold, is reported to be the most highly astringent tanning material known. The degree of astringency is one of the most important factors in vegetable tanning, relating directly to the power of a tannin solution to "draw" the fibers of animal hide and fix them into leathers of desired quality.

Characteristics of Tannins

The nature and properties of vegetable tannins and tanning processes have long been studied by many scientists, and publications on this subject would fill a large library with much still to be learned. The tannin from each plant species has its own constant characteristics. According to Valla, tanning extracts are essentially colloidal solutions in which the tannin particles (and also nontannins) are present in all forms of dispersion, even in mechanical suspension. Absorption by the skins of materials in the extract takes place in accordance with the size of the particles. The resultant leather is different in properties and qualities, according to the size of the precipitated tannin particles and the manner in which such precipitation takes place. Tannin extracts of high astringency, such as quebracho, have the power to contract the hide fibers strongly and fill in the spaces between these fibers, producing a firm, heavy, compact leather, such as is required for the hard wear given to shoe soles.

Two closely related trees, members of the same family as our common sumac, are the principal sources of quebracho tannin. They are found in commercial quantities only in Argentina and Paraguay, although they occur sparsely in adjacent portions of Bolivia, Brazil and, possibly, in Uruguay. The most important for commercial tannin is quebracho colorado (*Schinopsis lorentzii*) but as the wood of this becomes less accessible, quebracho macho (*Schinopsis balansae*) is likely to become more widely used than at present. A third, quebracho blanco, belongs to a different plant group and has insufficient tannin content to be of as great interest as the other two species. It grows in the same general region as the others but is more widely distributed.

The two species of chief interest for tannin grow within an area of approximately 300,000 square miles, but there usually are only 4 or 5 of these trees on an acre of open, mixed forest, with none in many parts of the forest. It is difficult for the quebracho experts to determine how much quebracho wood remains uncut. The most conservative consider that the supply will be scant within 25 years; others consider it adequate for 100 years at the present rate of use. Quebracho trees have evergreen foliage, with trunks occasionally 4 feet in diameter and 100 feet in height. The more usual size is from 1½ to 3 feet in diameter and from 18 to 36 feet tall, with tops of a distinctive V-shape. Their growth is relatively slow, so that the largest specimens may be more than 400 years old. However, some experts report that quebracho trees grow to sufficient size, with well-formed heartwood, to enable a tannin-wood crop to be harvested when the trees are 40 to 50 years old.

The formation of heartwood is important, since its tannin content is greater than in other parts of the tree. Tannin in the heartwood usually runs from 20 to 24 percent, with 3 to 6 percent in the sapwood and 6 to 8 percent in the bark. To bring quebracho tannin to the United States, the logs are shipped, in some cases, hundreds of miles by rail or boat to South American extract plants if it arrives here in manufactured form, or to the ports where the logs are loaded on vessels for exporting direct to the United States.

This wood has other uses than for extract. It is one of the heaviest and hardest of woods, very durable in contact with the soil. It is used locally for many purposes, such as cabinet making, house construction, and, especially, for railway ties and mine supports. It is a fine grained wood and takes a beautiful polish.

Future for Tannins

"Throughout the more densely populated regions of the earth," says Norton, "the available supply of vegetable material for use in tanning is steadily diminishing. Few parts of our globe possess such a variety of tannin-bearing plants and trees as those included under the designation 'Latin America.' A tabulation to include all tannin-yielding plants would embrace a large part of the vegetable kingdom as represented in the indigenous growths of Latin America. There is no question that the needs of the tanners in all countries can be easily and fully met by utilizing the vast and inexhaustible storehouses of tannin, revealed by a careful study of the forest treasures of Latin America." The entire western hemisphere, as well as the Argentine and Paraguay, has a vital interest in the scientific development and conservative use of these essential tannin supplies.

Rubber From Mexico

The semi-arid plains of north central Mexico abound in wild rubber-bearing guayulé shrub.

This interesting device is the scale on which the shrub is weighed at the guayule camp.

After weighing, the shrub is pressed into 100-pound bales by means of this ancient baling machine.

Mountain paths and barely broken trails are followed by the oxcarts as they wend their way to the pick-up station.

This belt convoys the guayule shrub, root and all, into steel rollers, where it is shredded before being placed in rotating drums or pebble mills. The guayule shrub is reported to contain a greater percentage of rubber by dry weight than any other known plant.

(Above) The shredded shrub is being placed in old fashioned rotating drums. (Below, left) After the rubber has been extracted from the shrub, it is dried in the trays pictured below and pressed into slabs of about 100 pounds each for shipment to rubber factories. (Right) Here is pictured a pile of the 50 kilo square sheets, ready for shipment.

These photographs are of the guayule area in north central Mexico, State of Coahuila, where the General Tire & Rubber Co. is building a mill to make more efficient the extraction of the rubber and to increase production for use in the American war program.

Switchboard for Agriculture

The ranchero from Mexico, the plant pathologist from Colombia, the grower of a new and important strategic material—all turn to the Division of Agricultural Cooperation for information and guidance.

Underwood & Underwood

José L. Colom.

by SOPHIA PODOLSKY

Beyond the patio of the Pan American Union building, with its quetzalcoatl fountain and the Peace Tree planted by President Taft, and overlooking the garden of Xochipilli, is the office of the Division of Agricultural Cooperation. To this organization, which combines the functions of handmaiden to the Inter-American Agricultural conferences and liaison for the distribution of agricultural information, are directed many of the agricultural queries of the American Republics.

Established in 1928 in compliance with a resolution passed at the sixth Inter-American Conference at Havana, the first function of the Division was to prepare for the First Inter-American Conference of Agriculture held in Washington in 1930. The preliminary program was prepared in cooperation with the United States Department of Agriculture. Outstanding specialists presented technical papers for round table discussion, and 54 official delegates and 168 consulting technicians gathered for the meeting.

Twelve Years Between Conferences

Arthur M. Hyde, then Secretary of Agriculture, welcomed the delegates. "Rarely," he said, "have . . . [international conferences] dealt, except incidentally, with agriculture. In this respect this conference is unique . . . The fact that this conference, half a world wide in its representation, is to deal exclusively with the problems of agriculture is significant."

From the 8th to the 19th of September, the delegates and consultants met daily, considered topics ranging rom tick eradication to soil conservation, passed resolutions and recommendations, proved that agricultural scientists were good neighbors.

Twelve years have passed since this first agricultural conference. Then came the Second Inter-American Conference of Agriculture, held in Mexico City in July 1942. Organized through the combined efforts of the Mexican Government and the Division of Agricultural Cooperation, this conference had as its theme—"The Impact of the Emergency Situation Upon the Present and Future Economy of the Western Hemisphere."

Things Accomplished

Of current interest, and because it proves that these agricultural conferences are more than discussion sessions, is the report on the 1930 conference. Fulfilled during the 12-year period were the resolutions pertaining to: 1. the reorganization of the Division of Agricultural Cooperation with an able technical staff equipped to prepare its own publications; 2. realization of the Inter-American Institute of Agricultural Sciences; 3. organization of technical commissions to make soil studies in the interested American countries; 4. distribution of seed of pasture grasses and forage crops; 5. formulation of an inter-American convention for the protection of flora and fauna of the Western Hemisphere; 6. publication of agricultural bibliographies; 7. distribution of educational films of the United States Department of Agriculture; 8. training of agricultural specialists.

The inevitable growth of the Division itself is reflected in the successful carrying out of these resolutions. First there was the task of extending its activities. This expansion is realized in the increased number of publications, translations, and information activities.

The most notable contribution rendered by the Division, and the one that reaches the widest audience, is its large number of publications which are printed in English, Spanish, Portuguese. In a collection that dates back to 1925, even before agriculture had its own Division in the Pan American Union, we find monographs on tropical fruits and animal diseases; later followed

studies on such topics of wartime interest as rubber, vegetable fibers, drugs, and the cultivation of complementary crops. Among the authors of this comprehensive collection are the names of such competent experts as Dorset, Mohler, Popenoe, Bennett, Edwards, Swingle, Uphof, Bondar—eminent zoologists and botanists and soil savers. These men and many others are removing barriers and establishing bases of understanding and a clearing house for knowledge.

The Importance of Co-ops

The series on cooperatives published by the Division has acquired importance in view of the growing interest in the co-op movement throughout the Americas. Several universities in the United States have included this series as background reading material in their economic courses.

Requests from colleges, universities, and agricultural societies relating to general information on agricultural resources and practices in Latin America have resulted in a new English series dealing with agriculture in the different countries. So far, studies of agriculture in Peru, Guatemala, and Mexico have appeared.

Casual though it may seem, an important service of the Division, is the reply to the diverse and constant flow of inquiries.

A veterinarian from Colombia writes to the Division: "For some time we have been experimenting with the use of the milk of the fig tree (*ficus glabrata*) for treating internal parasites of cattle. In this connection we would like to know . . ." and lists several queries relating to taxonomy, extraction, chemical reaction, bibliography. The Division forwards a translation of the veterinarian's letter to the United States Department of Agriculture, and back to Colombia goes the latest scientific data on the latex of the fig tree, supported by monographs and bibliography.

Bangs Disease and Jumping Fish

It may be the other way round. The Department of Agriculture prepares a bulletin on Brucellosis (Bang's disease—infectious abortion of cattle) and distributes it to various agricultural organizations in the American Republics. Dr. Armando Rodríguez Cáceres, chief veterinarian of the Department of Agriculture in Cuba, considers the study valuable enough to translate; sends his translation to the Pan American Union. Dr. Severin Fladness, of the Department of Agriculture, scans the new edition for technical accuracy, and Farmers' Bulletin No. 1871 on Bang's disease is ready for distribution to the American Republics. Result: 17 of these countries have requested and received the vaccine required for control and eradication of the Brucella organism.

Or, Mr. José Colom, Director of the Division of Agricultural Cooperation, will forward an insulated box full of trout eggs, pink and viable, to be reproduced and transplanted in Venezuelan streams. Two hundred brook trout eggs and five hundred thousand rainbow eggs for fresh running water were delivered in 1938 . . . "and they're still jumping!" says Mr. Colom. This is the Division's response to Venezuela's invitation to assist in its program of trout propagation.

Is there a cotton research experiment station to be planned? Is there an agricultural committee that requires a permanent secretariat? Does a student of agriculture want aid in selecting a college and curriculum in another Republic? Is advice needed in the selection of trained personnel for research organizations?

An answer is to be found from the Division of Agricultural Cooperation. By mail, by boat, by telephone, by pouch, and through the embassies and legations of the twenty-one Republics, the Pan American Union's Division of Agricultural Cooperation keeps the American Republics in contact with the newest agricultural developments.

Other Activities

The increased volume of agricultural development has resulted in the creation by the Division of technical committees to study the new problems. From such committees have come the Pan American Soil Conservation Commission and the American Society of Agricultural Sciences. The Divison has served in promoting nutrition and public health, in training agricultural

Patio in the Pan American Union.

leaders and extension workers of the other American Republics in the colleges and universities of the United States, in distributing a great deal of planting material, in protecting wild life. These are not purely wartime functions. Projects started now will be encouraged and developed and find a permanent place in the Division's work.

Site, Director, and Secretary

Highlight of the 1942 program was the final naming of the site and director of the Inter-American Institute of Agricultural Sciences.

Long a project of the Division, the Institute has at last materialized, with a program concentrated on the progress of education and science in the American Republics through teaching, research, and extension activities. For a long time there has been need to coordinate American agricultural research. Added impetus for the creation of such an institute came from Henry Wallace in May 1940. From this beginning to the final naming of Costa Rica as the site, Earl Bressman, director, and José Colom, secretary, the Division of Agricultural Cooperation has aided in what it considers to be one of the greatest projects in which the Pan American Union has engaged. Such an institute will provide scientific information required by the Division of Agricultural Cooperation. The Institute, on the other hand, will have in the Division an established medium for the promotion of its program and the dissemination of its data.

Pan American Union building.

Despite a limited staff and limited funds, there is nothing static about the Division of Agricultural Cooperation. It is alive to the wartime problems of agriculture. And yet, devoted to the ideals of the most peaceful of occupations, the Pan American Union's Agricultural Division promises to emerge from the exigencies of war as one of the most active agents in the satisfaction of the peacetime needs of the Americas.

Reading
ABOUT THE AMERICAS

Inter-American Affairs. 1941, Arthur P. Whitaker, ed.; 240 pp., Columbia University Press, New York, 1942. The first volume of an annual survey intended to cover important developments not only in the fields of politics, diplomacy, economics and finance, but also in cultural relations, social welfare, public health, and labor. The introductory chapter is a study of "A half-century of inter-American relations, 1889–1940"; the final chapter—"Summary and prospect"—offers a valuable interpretation of the trends of the year.

Four useful appendices give tables on Inter-American and World trade and on United States investments in Canada and Latin America; information about the area, population, and chief executives of the several countries; and an Inter-American chronology for 1940. The book is illustrated with three maps and concludes with an index.

Insect Invaders, Anthony Standen; 228 pp., Houghton Mifflin Company, Boston, 1943. Written by an author who, by training and experience, is fully qualified to discuss this technical topic, *Insect Invaders* lacks the exaggeration and inaccuracies that so often characterize a popularization of scientific knowledge.

The book opens with a general account of the form and habits of the different kinds of insects. There follow chapters on "Insects that harm man and animals," "Insects eat our food, and other things," "Good insects." Among the several chapters devoted to different methods of control, the account of the eradication of the Mediterranean fruitfly in Florida will be of interest to many. The volume is beautifully illustrated. All in all, this is a highly readable book and one of the best on the topic available to the general reader.

Inter-Americana. Miscellanea. Selected Bibliography of Books, Pamphlets, and Periodicals in English in the Field of Economics, Politics, and Sociology of Latin America, Richard F. Behrendt; 31 pp., School of Inter-American Affairs, University of New Mexico, Albuquerque, New Mexico, 1943. A useful bibliographical study, divided into six sections which deal with Latin America and Inter-American Relations in General, the Caribbean Area in Gen-

eral, South America in General, Individual Countries or Groups of Countries, Series, and Bibliographies.

Historia de las medidas agrarias antiguas, Luis E. Páez Courvel; 350 pp., Librería Voluntad, S. A., Bogotá, Colombia, 1940. A useful study of the varying values assigned to old Spanish land-measuring terms in different regions, different periods of time, and in the various documentary source materials which are quoted. Synoptic tables give the equivalents in modern measurements.

Notas Entomológicas da Baía. VII–VIII, Gregorio Bondar; pp. 268–303, 427–470, Rio de Janeiro, Brasil, 1941. Two separates from the *Revista de Entomologia*, with miscellaneous entomological notes by the Technical Consultant at the Central Institute of Economic Development at Baía.

Foreign Agriculture Bulletin

The Agriculture of Cuba, P. G. Minneman; 144 pp., Office of Foreign Agricultural Relations, United States Department of Agriculture, Washington, D. C., 1942. (Foreign Agriculture Bulletin Number 2.)

The economic tie between Cuba and the United States has always been close. Because of present war conditions and the strategic significance of the island's geographic position, Cuba has now become of even greater importance to the United States. On the other hand, Cuba is largely dependent upon its neighbor as a market for export crops, and particularly for the cane sugar which is the dominant commodity in the Cuban economy. During recent years the island has sent more than three-fourths of its total exports to the United States, and it has obtained more than two-thirds of its import requirements from this country.

Agriculture is the basic industry of Cuba. It gives employment to about half the working population and accounts for over 90 percent of the island's export trade. With good soil, a favorable year-round climate, and an ample labor supply, farming continues to be more extensive than intensive. Crops fall into two general classes: those primarily for export and the food crops for domestic consumption. On the basis of their export value, the most important crops are sugar, sugar by-products, tobacco, tropical fruit, winter vegetables, henequen, and coffee. Crops for home utilization are corn, beans, sweet potatoes, potatoes, yams, yuca, malanga, rice, and bananas. Livestock is of minor importance in general farming; cattle raising is largely confined to the large ranches in east-central Cuba.

After a brief description of the Cuban people, the natural resources of their island, and the economic background of the agricultural industry, this study surveys each of the principal export crops and a few of the crops produced primarily for domestic consumption. Methods of cultivation, volume of production, marketing practices, domestic consumption, trade, and Government measures are discussed in detail. Livestock production is also considered: work animals, meat production, the dairy industry, poultry, and trade in hides and skins.

A section on foreign trade points out the island's dependence on agricultural exports, the part played by the United States in such trade, and the effects of the present war on it. Finally, Cuba's agricultural self-sufficiency is evaluated; legislative measures affecting agriculture are cited; and future developments in agriculture are suggested. The study concludes with note of the literature cited.

This bulletin is for sale by the Superintendent of Documents, Washington, D. C. It was prepared by Mr. Minneman while on detail to the Department of Agriculture as a member of a commission which, early in 1941, studied possibilities for diversifying Cuban agriculture, at the request of the Cuban Government. At present Mr. Minneman is Agricultural Attaché of the American Embassy at Havana.

Farmers' Week In a Brazilian School

One of the two or three best-known agricultural schools in Brazil—the Escola Superior de Agricultura e Veterinaria—is located at Viçosa in the State of Minas Gerais. It offers three main curricula: an elementary 1-year course for practical farmers and farm administrators; a 2-year course, with more scientific training; and a full 4-year course which leads to the degree of agronomist. The school owns some 1,400 acres of land, which is used for pasturage and in the teaching of agriculture; of its more than 50 buildings, the main administration building and the students' dormitory are outstanding.

Visitors at the school are impressed with the practical nature of the courses offered, their orientation toward the agricultural problems of the State, and the close relationship which the school maintains with farmers.

Indicative of this relationship between school and farm is the annual Farmers' Week (Semana dos Fazendeiros), a unique institution in Brazil, which enrolls from 800 to 1,000 farmers for short courses. In 1941 over 90 such courses were scheduled, covering the cultivation of many crops, livestock improvement, crop and livestock diseases, the organization of cooperatives, manufacture of alcohol, forestation problems, the use of electricity on the farm, etc. During Farmers' Week, classes are held during the day, and evenings are devoted to lectures or to social gatherings.

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The late President Theodore Roosevelt discovered a Brazilian river—the River of Doubt.

Rural Society in Panama

The Republic must grow more food if its farmers are to supply the needs of the urban population and the Canal Zone, in addition to their own. Government aid to the farmers will lead to marked improvement in agricultural methods and standards of living.

Ofelia Hooper.

by OFELIA HOOPER

In the Republic of Panama the rural population engaged in agriculture represents about 55 percent of our total population of 632,000 inhabitants. Farm families maintain a self-sufficient economy almost devoid of exchange with the outside world; each family supplies its own food by cultivating the land in a primitive fashion, raising some animals, collecting edible fruits from the forest, and hunting and fishing.

When a young Panamanian farmer starts out in life, usually he chooses for his home a site where public land is available or where it is near by. The farmer seeks fertile soil, as shown by the condition of the forest; proximity to a river or a creek which may serve as water supply; sufficient altitude to avoid the heat and the mosquitoes; freedom from neighbors whose animals could destroy the family crops or whose crops could in turn be destroyed; and proximity to the parental home. These are the ideal conditions sought, but of course not always secured.

Then the family builds its home. Timber is used for the frame; palm leaves, sugar cane, or rice leaves make thatch for the roof; the walls are of bamboo or clay or there may be no walls at all. The forest furnishes vines and fibrous bark as substitutes for nails. The floor is the bare earth.

Under the thatched roof of the home is a bamboo ceiling, which often serves as a bed, or the family may use individual bamboo or wooden beds, fastened to the floor. Bedrooms are tiny—just large enough to accommodate the bed. Jaguar and deer skins and cow hides, banana mats, and blankets take the place of pillows, sheets, and mattress. Pieces of balsa wood serve as chairs, tables, and benches; hammocks and skins complete the furniture. The space not occupied by bedrooms becomes the combined kitchen, dining room, living room, and storage place.

The women cook over a wood fire on the floor, their homemade clay pots supported by stones placed around the fire. These clay pots, with wooden dishes and spoons and the sometimes prettily carved gourd cups, make up the kitchen equipment.

The diet of the rural family consists of coffee, tortillas, dried meat (if the man has killed a deer, rabbit, or wild pig), chicken, pork, or beef, rice, beans, cassava and other root vegetables, okra, tropical fruits, and peanuts. Pimentos and tomatoes are used only in the meat gravy. While the eating of raw vegetables, cabbage, and lettuce is unknown, people do eat fruit without cooking and also the heart of certain kinds of palm trees and the tender leaves of the toquilla plant and of a variety of pineapple.

After choosing its home site, the family clears about 12 acres of land by cutting down and burning the forest. Here, if fortunate enough to have obtained land of proper soil, it will plant rice, corn, root vegetables, beans, sugarcane, bananas, pumpkins, peanuts, and tobacco. Later coffee and cocoa trees will be planted, if the land is mountainous, or coconut palm trees, if the land is flat. In either case, the family will plant a few fruit trees, such as orange, lemon, mango, papaya, avocado, nísper, tamarind, guava, guanábana, pixbae, breadfruit, cashew, and plum.

Sometimes the rural family rents the land from the Government. The farmers make use of an old law in Panama which provides free land to every bona fide citizen who does not own any other rural land. A single man is entitled to 5 hectares (12½ acres); a married man to twice that amount and an additional lot of 5 hectares for each child. All that the farmer has to do is to apply to the proper authorities and register the title in accordance with the law. While rural families may own their land, there are economic and psychological reasons why they are not taking advantage of this privilege.

The arrangement is not very satisfactory as long as the only system of agriculture which the rural families know is one of extensive cultivation, where many times the acreage assigned do not meet the needs of an agronomic system which requires the use of a fresh piece of land each year. Until rural families learn and practice better agricultural methods which will permit them to raise crops on the same land year after year, they will not under-

stand the need of owning land instead of being tenants on public land.

And yet land use is more of a community than an individual matter. A man has the right to use neighborhood land, but not the right to retain it as private property. So strong is the feeling about neighborhood rights in the land that collective land utilization and the feeling of common ownership have persisted for the four centuries since the Spanish conquest, and in the face of great opposition.

The rural family does not use money to get the seasonal help agricultural work requires, but depends rather on an interchange of work known as the "junta." Such interchange has deep economic and social significance. A working party in which men compete in cutting down the high trees of the forest, in harvesting the crops, and, occasionally, in killing poisonous snakes, is much like the competition in sports in the cities. The better workers in the neighborhood and its prettiest girls are the first guests invited by the rural family to the "junta." Hard work in competition with the best workers, good company, good food, good drinks, and a general good time characterize the "junta."

The "junta" also provides the rural people their

Pan American Union photo

Papayas are the melons of Panama.

Pan American Union photo

San Juan ranch in Chiriquí.

opportunity for conducting their small business affairs, usually exchange of products. And it also furnishes opportunities for romance, news gathering, agricultural training, home training, and social training.

Each rural community centers upon a little village with stores, a church, the Government agencies and schools. At least once a year every rural family visits this village, bringing, usually on human shoulders, the farm and forest produce to be offered for sale. Members of the family walk to town, following the path to the village sometimes for 20 hours and sometimes carrying as much as 100 pounds apiece on their shoulders. They climb up and down hill and mountain, wind through the jungle, cross rivers and creeks without bridges, plod along under tropical rains or under the tropical sun. Children are carried on top of the basket which the mountaineers use for carrying their products.

Occasionally horses are used to take farm products to market. On the flat lands, oxcarts take over the loads; at the seaside, canoes are used.

Hog and cattle markets have some special characteristics in rural Panama. The rural family ties its cattle with ropes and drives them for hours to the little village where they are sold. The sale occurs at the end of the dry season when cattle are cheap because they have been poorly fed during the month when lack of rains kills grass. The cattle commission merchant buys the cattle, collects a few hundred in his pastures, and once a year resells them to the large cattleman who has good pastures close to the Pan American highway. This man in turn fattens the cattle during the rainy season, before slaughtering them for the market.

The annual cattle drive is a great event in the little village and causes unusual excitement. The men collect the horses and tie pieces of lumber to the bulls' heads in order to prevent their escape across the jungle. The boys look on or help the men. The women cook tortillas and fry bacon for the men to carry on the trip. The dogs bark and the cattle low. Early in the morning the cattle are gathered at the main street of the village. All traffic stops. Doors are closed and people gather at the windows to watch the men drive the cattle. These men either ride horseback or walk, and they

Pan American Union photo

A home in the village of Pacora.

are followed by dogs. The cattle drive takes several days. However, the older people think nothing of week-long cattle drives, because they remember when such trips to Panama City required 2 months.

Hogs are taken to the city markets and sold in the same way, except that they are bought at any time and are driven by men on foot, and only to the nearest highway where trucks pick them up.

The rural family of the Republic of Panama is large. Children, relatives, and guests are welcome, for they provide workers for the farm and company for the family. These rural people inhabit land which is bordered by two oceans and is divided by mountains, by the canal, by about 500 nonnavigable rivers, and by the thick tropical forest. This rural population is exposed to tropical diseases, especially malaria and hookworm. For these people the Agricultural Department of the Republic, together with other Government departments, is working today.

In turn, Panamanian rural society is working for the Government. The urban or commercial population of the Republic represents 45 percent of our total population. Most of these people live in the cities of Panama and Colón at the two ends of the Canal, but in the Republic of Panama. Before the war the urban population and the merchants used to import from abroad most of the food which they consumed as well as most of the food which they sold to the population of the Canal Zone and to the ships that used the Canal. Now that the war has made it difficult to transport food to Panama from abroad, the merchants and city people cannot get enough for their own use and for feeding the Canal Zone. Therefore the rural population of Panama must increase agricultural production for themselves and supply the cities.

The urban and commercial population of the cities of Panama and Colón comprise about 160,000 persons. The Panama Canal employs thousands of additional workers, many of whom cross frequently into Panama to eat there once or twice a week. The numerous soldiers and sailors do the same when they have leave. The sale of food to these people is important business to the people of Panama.

Panama must rapidly increase its production of food. And it must look to its farmers, who for centuries have produced for their own needs by their primitive agricultural methods. Never have the rural people of Panama produced food in appreciable quantities in excess of their own needs. They do not know how to do it, but they must learn in a short time. The Government of the Republic of Panama is helping to step up agricultural production rapidly, by putting resources for this purpose at the farmer's disposal.

This new policy will result in marked improvement in the Panamanian agricultural methods and standards of living.

Pan American Union photo

Breadfruit tree and cocoa bushes.

ALONG THE *Agricultural Front*

▲ Guayule Rubber Comes Into Industrial Production

Marking the first actual production of guayule rubber under the Department of Agriculture's Emergency Rubber Project, several hundred tons are now being extracted for war needs by the Forest Service.

The rubber is being processed chiefly from an old plantation of guayule purchased by the Government in the Salinas Valley of California. About 550 acres are being harvested and are expected to yield approximately 4,000 tons of shrub. Digging, baling, and trucking the shrub to the factory began in mid-January. The shrub harvest is to be completed during the winter season when the rubber content of the plants is highest.

The 13-year-old guayule shrub harvested for the current rubber extraction operation contributed an important share of the bumper seed crop collected by the Forest Service last summer and fall. In turn, this seed harvest made possible the rapid expansion of the project. Nursery acreage has been extended in the Salinas area, and new nurseries have been established at Indio, and Oceanside, in southern California. Additional smaller nurseries are now being developed near Bakersfield, Calif.; Phoenix, Ariz.; Las Cruces, N. Mex.; and Brownsville, Tex.

Although the guayule rubber now coming from the factory is the first natural rubber to be produced on an industrial scale in the United States since Pearl Harbor, this kind of rubber is not a stranger in the trade. Some commercial production from the wild shrub has been going on in Mexico for 40 years.

▲ Vegetable Oil Producers Form New Association

A Cuban Association of Vegetable Oil Producers has been created primarily to handle the increased production of peanuts for export to the United States. Membership in the Association is limited to Cuban vegetable oil crushers and refiners who actively operate industries for the production of vegetable oils using oleaginous seeds of domestic origin.

Purposes of the Association are: To divulge among the public the advantages of consuming vegetable oils and greases; to encourage the development and defense of the industry through increased planting of oleaginous seed, the establishment of experimental fields, and the production of select seed for planting; to maintain cordial relations with similar foreign industries to assure harmony between producers of the world; and to compile statistics on importation and consumption of oils and greases in Cuba.

The Association and its bylaws have been approved and registered by the Cuban Government.

▲ Argentine-American Chamber of Commerce Meeting

The Argentine-American Chamber of Commerce held its twenty-fourth annual meeting at India House, New York City, in mid-January.

A special committee was suggested to explore the trade situation with Argentina in the hope of bringing more dairy products to the United States, and a press committee, to release important information to interpret Argentina's position to the people of the United States.

The Chamber's annual report for 1942 noted particularly the activity of the so-called "Cheese Committee," one of several commodity committees created to facilitate trade between Argentina and the United States. In 1942 it prepared and distributed an extensive survey of cheese production and imports in the United States, covering a 3-year period, and a comprehensive survey of the standards of identification of cheeses. Other work which the Chamber did in behalf of members in the cheese business consisted in the matter of obtaining import permits and shipping space for Argentine cheese to the United States.

The annual report also summarized briefly the money and exchange situation in Argentine—United States relations, the shipping situation, the grain situation, the industrial situation, the status of the American and British blacklists, and the foreign trade situation. Also noted were the groups of Argentine exports, other than animal products, which have progressed most in the past four years.

▲ Foresters Search New Timber Resources

A United States mission of foresters, headed by Dr. Arthur Bevan, has gone to Costa Rica, Honduras, and Nicaragua to explore tropical forests for timber resources. The project is being undertaken in cooperation with Central American authorities and is financed by the Office of Inter-American Affairs in collaboration with the United States Forestry Service.

The mission will investigate supplies of mahogany, balsa and lignum vitae, all important in the wartime program. Mahogany is used in the manufacture of war planes, torpedo boats, landing boats, gliders, and other fighting equipment. Balsa, which is the lightest wood known—lighter even than cork—is considered the finest kind of material with which to build pontoons and floats; it is also used as filler for life

preservers. Lignum vitae, heavy, hard, and tough, is the best material known for the manufacture of bearings of small vessels.

Among many other woods sought in tropical America are the termite-resistant woods which could serve in place of steel and concrete in the bridges, pilings, and culverts needed in the construction of Central America's new strategic roads. The forestry experts will also investigate supplies of light woods for use in the manufacture of crates for boxing the vegetables sent to Panama in connection with Costa Rica's new food supply program.

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Venezuela's Declaration of Independence was signed in the main hall of the Municipal Council Building in Caracas on July 5, 1811.

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Mahogany trees may be seen along the streets in Valencia, Venezuela. These trees attain a height of 130 feet and have a diameter of 4 feet at the base.

AUTHORS in This Issue

All writers in this issue are connected with the United States Department of Agriculture. *C. O. Erlanson* and *B. Y. Morrison* ("'Good Neighbor' Flowers") are from the Division of Plant Exploration and Introduction; Mr. Erlanson is Ecologist and Mr. Morrison is Head of the Division. *S. B. Detwiler* ("Quebracho Makes Shoes") is Research Specialist in the Soil Conservation Service. *Sophia Podolsky* ("Switchboard for Agriculture") is on the staff of the Office of Foreign Agricultural Relations. *Ofelia Hooper* ("Rural Society in Panama") is an Agricultural Trainee from Panama, now with the Bureau of Agricultural Economics.

BRAZIL

(*Concluded from page 80*)

Population

Preliminary population statistics of the 1940 general census show total population as 41,565,083. Although Brazilians make up more than half of the people of South America, their numbers are not enough to occupy effectively more than a small part of their national territory. About three-fourths of the people live within 100 miles of the coast.

The language of Brazil is Portuguese.

Agriculture

Production of the State of São Paulo represents nearly 50 percent of the value of total agricultural production. The combined output of four States, São Paulo, Minas Gerais, Rio Grande do Sul and Rio de Janeiro, accounts for about three-quarters of the value of total production.

Coffee is the most important single crop; in 1939 it accounted for about 21 percent of the value of total agricultural production. Cotton follows with 14 percent. Next in importance are corn (12 percent), rice (8 percent), sugar cane (6 percent), manioc (5 percent), and beans (4 percent). Other important crops are oranges, cacao, bananas.

The livestock and allied products industry is centered chiefly in the States of Rio Grande do Sul and Minas Gerais, which account respectively for 23 and 27 percent of all cattle and for 22 and 26 percent of the hogs. Rio Grande do Sul has 68 percent of the sheep population; Baía follows with 9 percent. Goats are concentrated in the States of northeastern Brazil. In 1939, the value of meat production alone was greater than that of coffee. Hides and skins, the third item of importance in exports in 1939, were preceded only by coffee and cotton. Brazil is the largest producer of butter in the other American Republics and one of the largest suppliers of animal tallow and grease in the world.

Forests

Some people affirm that Brazil's forest area is above 500 million hectares or more than half the total area of the country. Woods of all kinds are found, from the lightest to the heaviest; there are many varieties of hardwoods used for construction of railway sleepers. About 84 percent of its lumber exports are made up of the so-called Paraná pine from southern Brazil, chiefly from Paraná and Santa Catarina.

Brazil has many tropical forest and extractive products such as rubber, babassú and Brazil nuts, and carnaúba wax; it abounds in wild oil seeds, of which the most important is the oiticica. Maté is another extractive product which comes from the forest area of southern Brazil.

AGRICULTURE IN THE AMERICAS — MADALINE W. NICHOLS, EDITOR

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Names and News

{Continued from page 62}

Ralph H. Allee. of the Office of Foreign Agricultural Relations, has been in Nicaragua and El Salvador conferring with the agricultural officials of each country and with U. S. D. A. appointees to the cooperative stations about plans for the collaborative program of agricultural investigation and extension. Chief problems considered were the choice of sites for experimental plantings and the development of outline projects for encouraging the planting of tropical crops required in the war effort.

Dr. E. W. Brandes of Rubber Plant Investigations, Bureau of Plant Industry, left in February for Mexico and South America. On this trip, Dr. Brandes is particularly interested in those rubber-bearing plants suitable for emergency production of rubber. Outstanding among the plants which confidently can be counted upon to furnish a quick source of crude rubber is the desert rubber-bearing shrub, guayule. Dr. Brandes held conferences with the officials of the Department of Agriculture of Mexico to agree upon possible expansion of cooperative research already under way on guayule. Under Dr. Brandes' direction, indicator plantings of this shrub were made in the spring of 1942 in Mexico by *Mr. O. D. Hargis* and indicator plantings have now been established in Chile and Argentina by *Dr. H. H. Bartlett.* It has been felt that further expansion of the exploratory work in Mexico is essential if full benefit is to be taken of the native areas of guayule and if the exploitation of wild guayule in Mexico is to lead to a permanent industry based on cultivated guayule.

After completing his conferences in Mexico City, Dr. Brandes visited cooperative stations in Mexico, Honduras, Ecuador, and Bolivia, both for conferences with the employees of Rubber Plant Investigations and for further talks with officials of cooperating Governments as to practical steps to make the best possible immediate use of available planting material in the establishment of rubber plantations in Latin America.

James M. Watkins and *William E. Martin* have returned from Puerto Rico where they studied the work at the Mayagüez experiment station. Among the interesting projects there, they report work with derris and experimentation with specialty crops.

Derris is a source of rotenone. Fortunately, a number of years ago, the Division of Plant Exploration and Introduction of the Department of Agriculture imported many plants from the Far East, and they were distributed to the Mayagüez station for trial. Here they have grown to such an extent that they now provide a much needed source for commercial plantings in Central and South America, and will gradually replace sources lost as a result of the war.

Among food crops, the production of which is being encouraged, are U. S. No. 34 sweet corn, developed at Mayagüez and one of the few sweet corns which will make good corn in the Tropics and an edible variety of soy beans (Seminole).

The Mayagüez station is also studying the culture of vanilla and methods of processing the bean and is experimenting with strains of bamboo resistant to beetles. The bamboo would be locally useful for the furniture industry.

At the Puerto Rican experiment station at Río Piedras, good plant breeding work is reported on sugar cane, field corn, beans, cucumbers, and long staple cotton. Other experiments of interest were the utilization of principles worked out by the Soil Conservation Service and their application to Puerto Rican conditions, and experimentation with the effects of air conditioning on dairy cattle.

BRAZIL

Land

Brazil, the third largest country in the world, is surpassed in territorial extent only by Russia and Canada. Its area exceeds that of the United States. It occupies a little less than half the area of South America. The State of Amazonas is almost three times the size of the State of Texas. Total area of Brazil is 3,286,173 square miles.

Climate

Brazil lies in three climatic zones—equatorial, subtropical, and temperate. While temperatures are moderately high throughout the year, no extremes are encountered; the temperature does not fall below an average of 53.6°F. or rise above an average of 82.4°F.

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Agriculture IN THE Americas

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IN THIS ISSUE

May 1943

VICE PRESIDENT WALLACE INAUGURATES NEW INSTITUTE

It gives me great pleasure to be in beautiful Costa Rica and to have a part in the inauguration ceremonies of the Inter-American Institute of Agricultural Sciences at Turrialba. First of all, may I congratulate this city in particular, and Costa Rica in general, not only because they have been chosen as the appropriate site for an institution of this type, but also because they have had the vision necessary to perceive what this Institute can realize in the years to come. . . .

All the Republics in this hemisphere have shared in the creation of this Institute. It is the hope that all will cooperate in its growth and in its development—not alone in the material sense, but also with ideas, leaders, and students. This undertaking is not, and should not be, merely the work of Costa Rica and the United States. This Institute must depend upon the entire hemisphere for its orientation; it must become a center of agricultural information. If that information is to be of use, it must be made accessible to the youth of the entire hemisphere, that it may be applied and utilized by all our peoples. An agreement between all the American Republics is being drawn to serve as a basis for this Institute and to assure its existence.

I place my most confident hopes in the young men who will meet here, when the necessary installations of the Institute will have been completed. In this tropical but delightful climate, students will learn not only science, but its practical application. They will exchange ideas; they will become informed of the rapid changes in the economic conditions of the world. Here they will experience the joy of discovering truth and of putting it at the service of a great industry—agriculture.

For years we have been talking of the need for such an institution as this. The present great emergency has crystallized those desires. Now we see before us its fertile lands and its beautiful site—broad expanses, exuberant vegetation, torrential streams, lofty mountains. In this place the young agriculturist will be able to do his best work. It does not seem possible to me that there is any cultivation which cannot be carried on here or in the immediate and accessible vicinity. It should be a pleasure to have a share in the activities of this Institute.

As Secretary of Agriculture I had the privilege of starting the collective hemispheric investigations on rubber—perhaps the strategic material of greatest importance at the present hour. In the adjoining Rubber Experiment Station you have evident proof of investigations planned to solve so difficult a problem. That same experiment station has been a center for the selection and development of rubber plants which will resist South American diseases, those diseases which, in the *past*, were the only factor limiting the profitable establishment of rubber plantations in Latin America.

Naturally, the Institute will turn its attention to various technical and economic problems referring to such realizable production as that of rubber, quinine, vegetable oils, fibers, and drugs. But far more important than these investigations of commercial agricultural products, in my opinion, will be the studies of progress in the conditions of rural living.

The Institute has already designated two hectares of its best land for the study of one aspect of the raising of foods for home consumption. The sociological and economic effects of such a project as this can change completely the course of life in this hemisphere, and in the span of a single generation. I am happy to state that the Institute recognizes the value of these studies.

In agriculture, isolated investigational projects are of limited value. It is absolutely necessary to combine the results of separate investigations, not only here in the Institute, but also in the associated agencies which are encharged with executing these projects in the whole hemisphere. One important aspect of this work will involve the analysis and coordination of these activities, so far as the limitations of this Institute may permit. This work of compilation will increase in importance as time passes and the various associated agencies progress in their findings in their turn.

In this broad program of investigations should be included studies in land-use planning, the conservation of natural resources, the utilization of hydraulic power—so abundant here in Turrialba—and the relation between industrial development and agriculture.

Through its very nature, changes in agriculture are slow. Harvests and livestock develop slowly. Customs—some well founded and others not—must be analyzed and extension techniques must be developed before discoveries can be utilized.

The Institute begins under difficult conditions, insofar as the scarcity of material for the construction of its buildings is concerned. I admire the boldness of its directors and its collaborators who set about the work, ignoring those obstacles. Everything promises great progress, and in short order.

I congratulate the Government of Costa Rica, its President, the Secretary of Agriculture, the Secretary of the Treasury and Commerce, and the rest of the Cabinet for the work already accomplished.

I now have the honor to declare inaugurated the Inter-American Institute of Agricultural Sciences. May its labor prosper and bear fruit.

Address at Turrialba, March 19, 1943.

Agriculture IN THE *Americas*

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What Shall the Americas Grow?

By test and experiment the best products and methods of culture can be discovered. Research applied to plants and animals should provide the answer.

Bachrach

Dr. Ross E. Moore

by ROSS E. MOORE

Agriculture's collaborative program in the Americas has its origin and base in the awareness of the American peoples that their countries are naturally interdependent, and in their common determination to supply and direct their respective efforts toward the realization of complementary social, cultural, and economic relations among the several Republics.

Since its founding the Department of Agriculture has cooperated with the Federal agricultural agencies of the other American Republics by exchanging scientific information and plant propagating material, by assisting in pest and disease control and in the development of superior plants and animals, and by loaning agricultural scientists. In July 1941, this collaboration was given added impetus by legislative action and the appropriation of funds for cooperation with the other American Republics to stimulate the production of complementary agricultural commodities.

The integrated application of diverse cultural skills and techniques wherever available to whatever required is necessary in order to bring about that development of agricultural production, processing, or trade needed to maintain agriculture abreast of the demands of our nations at war and capable of satisfying our peoples in peace. This fact was recognized long ago by agriculturists; it led to a coming together of men with diverse resources and to their collaboration in agricultural institutions, societies, and associations.

Since specific techniques are developed by attacking specific problems which arise at different times in different places and are studied in some places and not in others, there is great disparity in the distribution of agricultural experience and in the extent of the specific technical resources available within any given country or between countries. Therefore, in all countries there is a continual shifting of agricultural men from where they were developed to where problems require their qualifications.

The desirable development of hemispheric agriculture requires, not only that this movement of skills continue within the various Republics, but that the inter-American flow of these skills be facilitated from the country where available to the country where required. Facilitating the flow of United States agricultural skills to those of the other American Republics which have problems requiring their application and assisting in the effective solution of those problems are essential parts of the collaborative program of the United States Department of Agriculture.

Problems to Solve

To what type of problems and to the development of what agricultural commodities should the Americas direct their collaborative efforts? The problems of agriculture and the opportunities for agricultural development in the hemisphere are so numerous and varied that our efforts must be focused upon a related group of agricultural commodities and its attendant problems, rather than upon the entire agricultural field, in order to achieve appreciable results within a reasonable time. Therefore, the United States Department of Agriculture cooperates with other American Republics in assisting in the production of commodities in which our respective self-interests are complementary—the United States as a buyer and the other Republics as sellers.

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Self-interest is a potent factor in determining the relations of man to man, partner to partner, and country to country. The probability for the success of an undertaking which requires contributions by two or more men, partners, or countries increases as the results of the undertaking advance the self-interests of the collaborating units. Conversely, common endeavors fail by default if benefits do not accrue to all of the contributors; those units which receive no promotion of their self-interests withdraw their collaboration and, in those instances in which the results are not positive or neutral but negative, they frequently take the apparently logical step of interposing obstructions. Thus, the establishment of a collaborative program is based upon expectancy of beneficial returns to all the collaborators, and its permanence, upon the continued realization of these returns.

Self-Interest as a Basis

The self-interests of each of the American Republics in the fields of agriculture extend over a broad range. In a particular Republic a certain area within this self-interest range may be unique and not subject to collaborative advancement; a second area, bilateral and susceptible to bilateral collaboration; a third includes most or all of the American Republics, and advancement benefits and merits the support of most or of all.

In a program of American agricultural collaboration, areas of self-interest which are unique need not be considered except for their negative effect upon the program. Each Republic should search out its own unique self-interests, define them, and insist upon their exclusion, since their inclusion would result in apathy or obstruction and finally in the destruction of the program itself, including that part composed of interests common to many or all of the American Republics.

Complementary Agricultures

In agricultural production, processing and trade, problems of common interest to many or all of the American Republics—appropriate subjects for profitable collaboration—exist in quantity far greater than the hemisphere's combined collaborative capacity. One well-known fact worth repeating is that every single country of Central or South America produces to some extent agricultural commodities which North America must import. For the majority of these commodities the application of technical resources—best made available through collaboration—results in increased quantity and efficiency of production and improved quality of product, improved trade and standards of living for the collaborating Republics, and greater national and hemispheric stability.

The more important complementary agricultural commodities include rubber, vegetable insecticides, vegetable fibers other than cotton, medicinal plant products (quinine), certain vegetable oils, essential oils, and spices. There are certain factors regarding each of these commodities which give them their place of importance in the collaborative program and which also determine the character of resources the respective Republics should supply as well as the best method of organization to

Site of the agricultural production station at Tingo María, Peru. Taken in 1940, this photograph shows partly cleared land between the Huallaga river and the tropical forest. In the foreground are the hotel and various small residences.

insure the maximum production of commodities per unit of collaborative effort.

These factors are: (1) The United States normally imports almost its entire supply of these commodities. (2) Natural conditions are favorable for the production of some or all of them in parts of all of the other American Republics. (3) All of the other American Republics normally import a portion of their requirements of some of these commodities, and the import position of many of the Republics in this regard is similar to that of the United States. (4) Winning these commodities from wild sources cannot compete economically with their production under cultivation. (5) Crops yielding these commodities have been cultivated relatively little to not at all in this hemisphere. (6) The best environment for the production of most of these commodities is in the humid tropics, with their high rainfall and high temperature. In the Western Hemisphere these regions are relatively sparsely populated, unexploited agriculturally, and with meagerly developed communication, sanitation, and industrial services.

From a consideration of the above factors, it follows than an increase in production of complementary commodities in the Western Hemisphere is desirable and possible, but that the important factors determining the rate of this increase are the speed with which we accumulate dependable production experience in the hemisphere, and the effectiveness with which that experience is applied where needed. Only in this way can we bring about effectively the establishment of stable agricultural communities equipped with communication, sanitary and other essential services, and dedicated to the production of complementary commodities as cash crops.

Value of Collaboration

Development of agricultural production, processing, or trade is slow. While well-directed collaborative efforts will induce early stimulation, significant stable improvement in volume and efficiency require sustained effort over a considerable period of years.

With this background of the factors involved in any program for increasing the production of complementary crops, and with the enthusiastic support of the other American Republics, the United States Department of Agriculture, through the Office of Foreign Agricultural Relations, has adopted agricultural production stations as the best mediums through which to apply the production resources of the various Republics to the job at hand. The Department of Agriculture has entered into agreements with corresponding Federal agencies of many of the other American Republics for the cooperative establishment and operation of these stations. Their functions will be agronomic investigation, research, demonstration, extension, and the selection and multiplication of superior

Hog barn, set on newly cleared land and backed against the forest.

plant and animal propagating material. These production centers will accumulate rapidly the experience necessary to agricultural production on a commercial scale and, concurrently with this investigational work, they will encourage and give service to farmers who are entering commercial production.

United States Contributions

To these stations the United States contributes agriculturists who are qualified to perform such functions as directing the program and heading up the agronomic, horticultural, and pest and disease control activities. The other Republic contributes agriculturists to work in cooperation with those supplied by the United States Department of Agriculture; it supplies lands, buildings, skilled and unskilled labor, and the general operating expenses of the production station.

General production stations are now operating at Tingo María (Peru), Quevedo (Ecuador), Recreo (Nicaragua), and San Andrés (El Salvador). Negotiations are under way for the establishment of other stations. In addition to these, United States Department of Agriculture Cooperative Rubber Plant Field Stations are in operation at Turrialba (Costa Rica), Tela (Honduras), and Marfranc (Haiti). Department of Agriculture personnel dedicated to rubber work are also assigned to agricultural experiment stations of most of the remaining eleven Republics with which the Department of Agriculture has cooperative agreements.

Subsequent articles will give, country by country, an account of the organization and operation of these various stations and of our other agricultural work in cooperation with each American Republic.

Building Breeds for the Tropics

An improved tropical dairy breed of European-zebu or European-native blood is nonexistent at the present for use in improving dairy cattle in the tropics through the grading-up process. The creation of such a breed awaits the skill of some master breeder.

by ALBERT O. RHOAD

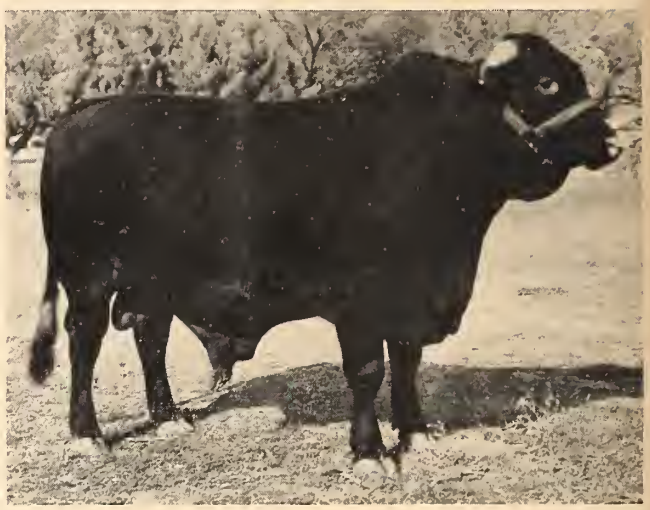
Agricultural leaders throughout the American tropics generally recognize that new breeds of beef and more especially dairy cattle adapted to the rigors of a tropical environment must be evolved. Recent research in Brazil, the United States, and South Africa has clearly shown that ability to stand tropical climatic conditions is as much an inherent characteristic of breeds as capacity to produce milk or beef. Experience and experiment have also shown that in general the highly specialized breeds of European origin have low tolerance for heat and do not thrive in warm climates, while breeds of Indian origin and some of the native cattle of Central and South America show high tolerance for heat and are, therefore, constitutionally suited to develop in a tropical environment.

To combine the capacity for high production of European cattle with the high resistant qualities of the zebu or native cattle in order to develop new superior types is one of the major breeding problems confronting the improver of livestock in the tropics.

Contributions of the Santa Gertrudis Breed

In the solution of this problem the Santa Gertrudis beef cattle have made two very significant contributions which are of interest to the breeder of cattle in the tropics. They are, first, that starting with good foundation stock, new and improved breeds of cattle can be evolved through judicious cross-breeding, skillful selection, and intelligent mating; and second, that the beef production of tropical cattle can be improved through grading-up to a breed of predominantly European blood, without materially reducing the heat tolerance or adaptability of the progeny.

Crossbreeding the heat tolerant zebu or native cattle with the highly specialized European breeds is one of the methods through which new and improved breeds adapted to the tropical environment may be evolved. It is, however, the most precarious method at the disposal of the breeder. It is hazardous, for it necessitates the mating of crossbred sires with crossbred dams; if not systematically done, such mating will more often bring about the creation of nondescript herds of low market value than the establishment of new improved



Unico, a 22 months old Santa Gertrudis bull. Weight 2,000 pounds.

types. The possibility of the establishment of new and improved breeds through careful crossbreeding of European and Indian cattle is one of the important contributions of the Santa Gertrudis to livestock improvement in the tropics.

The establishment of new breeds through crossbreeding is a long process, which usually requires many years of continuous effort. It has often been debated as to whether new breeds of our larger farm animals can be evolved within the lifetime of an individual breeder. The Santa Gertrudis breed proves the possibility, for 22 years after the crossing in 1918 of zebu bulls on purebred Shorthorn cows, the descendants were recognized as a distinct breed.

A quarter of a century is about as short a period as can reasonably be expected in which to develop new breeds of cattle. Considering that some of our modern breeds have taken centuries to develop into their present well-balanced form and high productive efficiency, this is a very short time. Science and the practical breeder have been largely responsible for the more speedy arrival at the goal set. With the aid of our present knowledge of the science of animal genetics, the livestock breeder can follow proved procedures and avoid some of the costly pitfalls in his breeding operations.

The development of superior new breeds of large farm animals through crossbreeding is not a recommended task for the breeder with a small herd, limited time, and capi-

tal; it takes considerable equipment, experience, and technical knowledge to achieve success. It is, however, a proper field of endeavor for government experiment stations or large ranches where material is available and continuity of effort is assured.

For these reasons not many breeders and only some agricultural experiment stations will undertake the task of developing, for the tropics, superior new breeds through crossbreeding. On the other hand, most breeders are concerned with improving the productive capacity of their herds for immediate commercial purposes. The time-honored system of attaining this end has been the practical method of grading-up the herds to an improved type by use of purebred sires. This method has been very successful in many parts of the world. The generally high quality of farm animals in the United States is the result of a long grading-up of common herds by the use of purebred sires. It is the recommended method where the purebred sire is of a breed adapted to the environment in which it is placed.

In the tropics the method has not proved successful with cattle, when purebred sires of European origin have been used. Grading-up to the improved type of zebu or native cattle, on the other hand, is successful and is being done on a large scale in many parts of the American tropics. The failure, in the tropics, of grading-up to the European type is attributed to several causes. European breeds generally are not adapted to a tropical climate because of their low heat tolerance. When bulls of these breeds are continuously used in grading-up tropical types of cattle, they greatly reduce the heat tolerance of the progeny. As a result the progeny decrease in size, vigor, and productiveness.

To overcome this degenerating effect of grading-up to the low heat tolerant breeds, it is the practice in some regions to "refresh" the herds by returning occasionally to the use of zebu or native type bulls. This practice, technically known as backcrossing, has been employed successfully with beef cattle along the Gulf Coast of the United States and in Minas Gerais, Brazil, and in Trinidad with dairy cattle. After the heat tolerance of the herds has been re-established through backcrossing, the grading-up method may continue through the use of purebred sires of the European breed originally selected for grading-up.

There are other factors that have caused the failure of grading-up to European breeds in the tropics. Most important of these has been the high mortality of the purebred sires, especially when placed under range conditions. Another is the low fertility of the European type bulls in the tropics. Recent research at Purdue University and the Bureau of Animal Industry has shown that continuously high atmospheric temperatures materially lower the fertility of the males of low heat tolerant breeds of cattle.

Before a continuous grading-up program can be effective in the tropics, it is necessary to have breeds of high productive efficiency possessing high tolerance for heat. When continuously crossed on low producing cattle of the tropics, these breeds will progressively improve the productive efficiency of the offspring without materially lowering their heat tolerance.

Developed by crossbreeding the zebu with the Shorthorn, the Santa Gertrudis is the first American breed of predominantly European blood which possesses high productive efficiency and high tolerance for heat. Considerable numbers of Santa Gertrudis bulls are being used in several Central and South American countries in grading-up native type cattle. The results are being watched with interest.

In the future other new improved beef breeds carrying a high proportion of the blood of some specialized European breed with sufficient zebu or native blood to assure adaptability to warm climates, may be evolved and used in grading-up programs. For the present, only the Santa Gertrudis is available.

An improved tropical dairy breed of European-zebu or European-native blood is nonexistent at the present for use in improving dairy cattle in the tropics through the grading-up process. The creation of such a breed awaits the skill of some master breeder.

Group of Santa Gertrudis heifers.

Rear view of same group of heifers.

Mexico, A Real Neighbor

With a rich heritage of ancient American civilizations and a modern social vision, our southern neighbor, Mexico, stands today in the vanguard of those who work for inter-American solidarity and for the rights of man.

by PHILIP LEONARD GREEN

The United Mexican States constitute the one Latin American republic which may be reached from the United States of America by simply crossing a frontier. This fact has shaped the entire history of the relations of the two countries. At times considered by many Latin Americans as an outpost of the United States or as a bulwark against that country, Mexico has become one of the most loyal and effective nations in promoting the cause of true inter-American friendship.

With an area of some 760,000 square miles—about one-fourth the size of the United States—Mexico has a variety of climates, products, and peoples. A noteworthy commentary on the general interest the country arouses is the fact that about a third of all the books written in the United States on Latin American lands are devoted to Mexico. Tens of thousands of tourists from the United States have visited the neighboring republic since the early twenties.

The reasons for this unusual interest are not hard to find. Mexico was the seat of outstanding native civilizations long before it became the viceroyalty of New Spain; the influence of these cultures is still plainly evi-

Mexico has many agricultural valleys in which irrigation plays large part.

dent to any observant visitor. The Maya culture, considered by many scholars to represent the pinnacle of ancient American civilization, is one case in point. Maya priests were versed in mathematics and astronomy. Maya arts and manufactures have been a continued source of fascination to those who have studied them. The Mayas have been called the Greeks of the ancient American world, while the Aztecs, who settled in the central valley of Mexico, have been likened to the Romans. It was the Aztecs who founded Tenochtitlán—forerunner of the present-day city of Mexico—over a century before Columbus' first trip to America.

One can hardly attempt to understand the Mexico of today without knowing this background, for the native civilizations encountered by the Spaniard are still evident on all sides. About 2,000,000 Indians in Mexico use little Spanish, but prefer to speak their native languages. Of these tongues there are over 50. Pure-blooded Indians account for 30 percent of Mexico's some 20,000,000 inhabitants, while another 60 percent are of mestizo or Indo-Hispanic stock. Only 10 percent belong to the race of the Spanish conquistadores, but these exercise an influence far greater than their numerical strength would indicate.

Mexico's 20,000,000 inhabitants place her second only to Brazil in population, among all the Latin American Republics.

Over 65 percent of the Mexicans live by farming and allied industries. But since much of the nation's land cannot be farmed, on account of dryness or its mountainous character, it is not hard to see why land has been at the bottom of practically every Mexican problem.

It was land that formed the basis of what is known in Mexico as "The Revolution"—a process that has been in progress for over 30 years.

After the conquest the Spanish monarchs, in their desire to reward those who had distinguished themselves as warriors, made huge grants of land known as *encomiendas*. Even after the colonies became republics, vast estates continued to be passed down to the descendants of the conquistadores, so that it was not unusual in Mexico, as in other Latin American countries, to find 12,000-acre stretches in the hands of one family. In one case, an entire State was virtually owned by three brothers.

It was to change this uneven distribution of land that the revolution was begun, and to this end its various leaders have worked with greater or lesser devotion, as the case might be.

In dividing up large land holdings, the successive administrations have not felt that they were introducing something new or un-Mexican, but rather that they were returning to the Aztec system of community ownership, practiced by the Indians at the time the Spaniards came. They point to the fact that the communal land system

Courtesy of the Mexican Embassy

A path in the woods of Chapultepec, one of the world's most beautiful parks.

had a precedent in Spain itself, where communal units (*ejidos*) were given special rights.

Mexican and other authorities emphasize the fact that the agrarian reform which brought about this change in the holding of land is the basis of Mexican agriculture. The reform did not cover the so-called "small" properties of from 250 to 500 acres. The present Government tries to guarantee the rights of small property owners.

The results of the agrarian reform have not always been satisfactory. In some cases the properties given to individuals have been too small to permit profitable farming. Then, too, a good deal of land has been allowed to remain idle or has been improperly used. As a result, Mexico has had to import a number of products of which she should have had a surplus. In the fall of 1936, a movement was started for cooperative production, under the Banco Nacional de Crédito Ejidal. This bank undertook to buy machinery and to provide farmers with technical advice. Farmer members of the bank draw wages from credit funds. They select their own overseers. The bank also undertakes to market what they produce.

One of the collective experiments that has received widest publicity is that of "La Laguna." It comprises a tract of land of about 1,000,000 acres in the states of Coahuila and Durango. Of this area, about 300,000 acres are arable. About $12,000,000 have been spent on irrigation. The project involves 32,000 workers. Other agrarian collectives deserving mention are those in the Imperial Valley of Lower California (cotton and

Historic Mexico

Some 30 miles out of Mexico City is Teotihuacán—City of the Gods. Here are the famous pyramids of the Sun and Moon and the temple of Quetzalcoatl, that fair, wise God, whose emblem was the feathered serpent. (Above) The pyramid of the Sun. Its base measures 751 feet by 721 feet; it is 216 feet high. On the western side, steep steps lead to the top, where in preconquest times bloody sacrifices did honor to Indian Gods. (Below) A section of the temple of Quetzalcoatl. Covered with crumbling stone, blown earth and sprouting green, the temple looked innocently like a hill until archaeological investigation disclosed the pyramids beneath. (Right) Detail of decorative motif of the temple.

(Above) Legend tells that the Zócalo, or great square, which is the center of modern Mexico City, was the island on which the Aztecs first saw the symbolic eagle perched upon a prickly pear and devouring a serpent. So the Gods had indicated the site of the Aztec capital, Tenochtitlán. Conquering Spaniards raised a Spanish church on the base of the old pyramid to those heathen Gods. To the right of the square is the National Palace, built on the site where stood the palace of Emperor Montezuma, and where Cortés had his own palace in his turn. (Right) Lovely Spanish colonial convent of La Merced. (Below) On clear days, the volcano of Popocatépetl can be seen from the capital, lording it over the valley of Mexico.

wheat); the Yaqui Valley in Sonora (wheat and rice); the Lombardía and Nueva Italia projects in Michoacán (rice and fruits); and the henequen projects in Yucatán.

There are, of course, differences of opinion between partisans of individual ownership and the communal system. Actually, Mexico's agricultural problems would be complex under practically any system.

In practically every region, communication facilities constitute another important difficulty. Furthered by broken country and the scarcity of roads, a considerable amount of regionalism has persisted since early times, and this occasionally colors national affairs.

Local markets have played an important part in the commercial life of the country. Here one may see on sale such varied products as chili beans, limes, cherries, spices, apples, eggs, and cotton textiles.

As has been pointed out, agriculture is at the bottom of most Mexican problems and that is why so much

Courtesy of the Mexican Embassy

Mexico's Ministry of Agriculture has its offices in this building of the National School of Engineering.

emphasis has been given to it. Yet Mexico produces many other commodities besides farm products, and some of them are very important to her national life. Among them are oil, silver, lead, mercury, and antimony. In silver alone, Mexico provides one-third of the world's supply. One mine, the Real del Monte, still produces a sizeable proportion of the total, though it has been worked since the days of the Aztec ruler, Montezuma.

For many years oil proved one of Mexico's chief problems in her relations with the United States. At one time (1925), the country produced as much as 100,000,000 barrels a year. By 1939, this amount had fallen to 42,000,000 barrels. The intervening years had seen a succession of conflicts between the Mexican authorities and the foreign oil interests, with final confiscation of the oil properties by the Government. At one time, this oil question came dangerously near to wrecking relations between Mexico and the United States. Happily, these difficulties seem to have been settled.

In addition to its vast agricultural population, Mexico has about 1,000,000 industrial workers. Of these, 250,000 are in various manufacturing industries; 90,000 are in mining, 80,000 in communications, and 17,000 in oil. There are two national labor organizations—the Confederación de Trabajadores Mexicanos (C. T. M.) founded in 1936 and with 450,000 members, and the Confederación Regional de Obreros Mexicanos (C. R. O. M.), which has 125,000 members.

Along with social legislation, the Government has made efforts over a long time to educate the people of the country. In Mexico, there are over 10,000 village schools which serve also as community social and health centers. Government statistics on illiteracy show a decrease from 90 percent in 1910 to 60 percent in 1940. Night schools are also provided for those who cannot attend by day. There are 14 agricultural schools in the country.

Public health, rural electrification, building, and irrigation are being promoted by the Government.

Always rich in literary and artistic productions, Mexico has produced an unusually striking array of writers and artists in recent years. Some, such as Diego Rivera and José Clemente Orozco, have become as widely known in the United States as in their native land. The composer Carlos Chávez has conducted orchestras in this country and is widely known for his work in the classic field. But it is in popular music that Mexico has made its most typical contributions. Popular songs, called *corridos*, frequently are sarcastic verses on events and people of the hour; they exude the very atmosphere of Mexico, if one understands their words and the background.

A Friendly Neighbor

In the present emergency, Mexico has cooperated closely and skillfully with the United States. Once a happy hunting ground for German propagandists, Mexico has taken energetic action against them. She seized 12 Axis ships at Tampico and Vera Cruz. Under a convention signed on April 3, 1941, the mutual use of air bases by pilots of Mexico and the United States was arranged. Even earlier, on December 26, 1940, the Mexican Senate had given authorization for permission to make several Mexican airports available for use by United States pilots. A Mexican-United States Joint Defense Commission had been in operation for some time prior to Mexico's formal declaration of war in 1942. Mexico had also cancelled an oil concession of 247,000 acres to the Japanese in October 1940 and had stopped shipments of mercury to Japan.

At the various Pan-American gatherings, Mexico has played a most important role, both as a champion of human liberties and as a protagonist of genuine inter-American cooperation.

In the days to come, it is not improbable that the values which are being created by the cooperation between Mexico and the United States, may be veritable assets in the building of a new inter-American civilization.

Tapioca From a Brazilian Root

One of the most important food plants in the world, manioc has been relatively unknown in the United States, because it is produced primarily for local consumption in the tropics and subtropics. Here it is used mainly in its processed form of tapioca.

by DONALD D. BRAND

As the story goes, the white man first discovered the diamond area in Venezuela Guiana when one examined some sharp stones set in the grating board used by a native woman. The stones were diamonds. But the woman's interest was in the manioc she was busily grating.

To the average American, manioc is probably a meaningless word, but a few of our southeastern farmers would recognize this American food under the name cassava, and everyone knows it in the processed form of tapioca. These names come from American Indian languages, since manioc is a plant native to tropical South America.

The most widely spread of existing linguistic stocks in tropical America are the Arawak, Carib, and Tupí-Guaraní, and the ancestors of these peoples are suspect as the main carriers of manioc. The insular Arawaks called the plant *yuca*, and as this term was carried south by the Spanish conquerors, in most of Spanish South and Central America *yuca* has now displaced the local Indian names. In Mexico *yuca* vies with *guacamote*, a name of Mexican origin which apparently meant "the sweet potato that grows from a tree" and which implies a later appearance of manioc than of the sweet potato in Mexico. In Brazil, Paraguay, northeastern Argentina and Uruguay, manioc goes by the name of *mandioca*, which is of Tupí-Guaraní origin. However, a distinction was made by the Indians between sweet and bitter manioc, some terms for the sweet being *boniata* (Arawak) and *aypi* (Tupí-Guaraní), while the bitter was called *yuca* (Arawak) and *manioch* (Tupí-Guaraní).

Value of Manioc

Considering its acreage, tonnage and distribution, manioc definitely occupies a place among the ten most important plants contributed by the Americas to world economy—maize, New World cottons, the white potato, tobacco, New World beans, peanuts, sweet potatoes, manioc, Hevea rubber, and cacao. Although it is probably also one of the twelve or fifteen most important food plants in the world, little is found about it in most works on economic geography or agricultural statistics,

Dr. Francis Thurber, of the United States Department of Agriculture (right) and Agricultural Attaché E. P. Keeler (second from right) in a manioc field at harvest time, with Brazilians interested in the culture of this crop.

because the plant is grown only in the tropics and subtropics and because it is produced primarily for local consumption.

Manioc is an herbaceous shrub, three to eighteen feet in height. It belongs to the Euphorbia or spurge family, which also contains such plants as the castor bean, Hevea rubber, and the poinsettia. Like these other plants, manioc has a milky fluid or latex. But its value to man is in its long tuberous roots.

There are hundreds of cultivated varieties which differ in many little ways and especially in their content of a poisonous glucoside, manihotoxine, closely related to hydrocyanic or prussic acid. Elevation, cooler temperature, and other ecologic factors, however, are seemingly more important than heredity in determining the amount of poison. This poison varies also with the age of the plant and with position in the root.

Of the nearly 150 species of *manihot*, all native to the New World from Mexico to Argentina, only the manioc is cultivated commonly. It is a highly adaptable plant and can be found cultivated from seacoasts to continental interiors, from sea level to 7,000 feet elevation, in areas of less than 20 inches of rain to regions of excessive

precipitation, and in almost any soil except that of swamps or saline areas. However, manioc must have a consistently warm climate (the optimum is a mean annual temperature around 76° Fahrenheit, with only a slight range), and it does best under conditions of high relative humidity near seacoasts and in sandy loams. In general, cultivation is restricted to areas of tropical rain-forest, tropical monsoon, tropical savanna, mesothermal savanna, and the warmer wet, temperate climates. In areas of industrial production, especially the East Indies, manioc often is interplanted with rubber.

Propagation is usually by planting cuttings. The tuberous roots range from white to red in color and may attain lengths up to 3 feet and weights up to 50 pounds. Planting is done at the beginning of the rainy season; the crops may be harvested at the end of 6 months, although most manioc for common food purposes is gathered between 8 and 10 months after planting and manioc for industrial purposes is allowed to stay in the ground from 12 to 24 months. Usually a plant is fully mature and with its highest starch content at the end of 18 to 20 months. For the subsistence farmer there is no storage problem, since he can leave his crop in the ground until it is needed.

Industrially processed manioc commonly comes in four general forms—dried slices, meal and flour, flake and pearl tapioca, and compressed residue. The United States mainly imports tapioca and flour, while western European nations import all forms. Besides the well-known uses of tapioca and the subsistence uses for manioc in the producing countries, there are many other uses to which manioc derivatives are put—especially in western Europe. The dried slices are utilized in making food starches, laundry and sizing starches, glue and postage stamp adhesive, glucose, dextrine, syrups, ethyl and buthyl alcohol, acetone, and animal fodder (especially for swine and cattle). The flour makes easily digested biscuits, crackers, buns, porridges—much like arrowroot.

Typical field of manioc in São Paulo.

Manioc has been known to Europeans ever since the first voyage of Columbus, and the German naturalist, Marcgrav, described it scientifically three centuries ago from his visit to the Dutch-held portions of Brazil.

Just exactly where and when manioc was first cultivated in tropical South America, is an open question. As there is a concentration of the greatest number of both wild species of *manihot* and of cultivated varieties of manioc in Brazil, most botanists select that country as the original habitat. Cultivation began so long ago that a wild form of the cultivated species is unknown; either the wild ancestral form died out, or cultivation produced such marked specific changes that the relationship can not be established. It is quite probable that manioc is among the three or four oldest cultivated plants in the New World and that it is as old or older than any cultivated plant of the Old World.

Where Manioc Grows

Manioc does not have the wide range of such plants as maize and beans because, like the potato, it has stricter climatic limitations. Yet when the Spaniards came to the New World, they found manioc cultivated from southern Mexico and Cuba to southern Peru and southern Brazil and Uruguay. From the evidence of the distribution of varieties, local names, archaeologic occurrence, and tribal history and tradition, we can assume that at some early time—probably many thousands of years ago—an unknown Indian group began the cultivation, probably somewhere in Brazil and possibly in the plateau area of Goyaz and Minas Gerais, where the greatest number of varieties are cultivated today. In time, great immigrations and emigrations of peoples carried manioc southward into the Plata drainage area, westward across the Andes to the Pacific coast of Peru, and northward into the West Indies and Central America.

Although there was quite a mixture of the more poisonous (bitter) and the less poisonous (sweet) manioc in Brazil, the first Europeans found the bitter manioc dominant throughout South America east of the Andes

Manioc roots. For the most part, they grow near to the surface of the ground somewhat in the manner shown.

and in the Antilles, while only sweet manioc was raised in western South America. Both types were present in Venezuela, Colombia, and Central America.

Manioc was used by the Indians in many ways. The bitter manioc was scraped or peeled, and grated; most of the poisonous juice was squeezed out. Then the raw pulp, or a meal made by drying and sifting, was made into a thin cake and cooked on a terra cotta pan or griddle. The bread resulting from this most common method of preparation was known in the areas of Arawak speech as *casabi*, which gave us our common American name for the plant. The word tapioca is from *tipiog* (Tupí-Arawak), and was applied to the fine flour or starchy powder that was obtained as a precipitate from an infusion of the grated manioc. The starchy powder or flour and the coarser meal also were used raw or toasted in preparing drinks and gruels similar to the Mexican *atole* and *pinole* from maize. In western South America, where maize was the breadstuff, the sweet manioc was commonly prepared as a pot vegetable, and bread was not made with it until the practice was introduced from the Antilles by the Spaniards. However, as the writer can remember from his early years in Peru, the common way of eating manioc is to boil it like a potato or parsnip.

The expressed poisonous juice of the bitter manioc was used raw as a poison, or was partly boiled down to form a sweet drink which with time turned into an intoxicating beer. This juice, concentrated by boiling, became *cassareep*, which is an ingredient of our better known meat sauces. The most common way of preparing beer was to masticate freshly made manioc "bread" and then to soak this pap in water until it fermented. Beers were also made from the juice of the sweet manioc.

The spread of manioc to the Old World was primarily through the Portuguese and not the Spaniards. Manioc was the staple crop among the Indians of coastal Brazil where the Portuguese settled, and its roots were sometimes taken as provender by Portuguese ships en route to India and, to a far greater extent, by the ships in the slave traffic between Brazil and Portuguese Africa. By 1550 manioc was probably already established in Guinea, Congo, Angola, Mozambique, and the Malabar Coast of India. During the next hundred years the Portuguese, Spaniards, and Dutch introduced the plant into the East Indies and south China. In the eighteenth century Frenchmen brought it into a number of the Indian Ocean islands, especially Reunion and Mauritius, but it was not until the nineteenth century, however, that commercial production was developed by the Dutch and French in the East Indies and the Indian Ocean islands.

In the meantime manioc had encircled the earth and become an important item in the diet of the native populations of all of humid tropical Africa, Asia, and Oceania. In the New World its cultivation extended from southeastern United States and Baja California in the west to northern Argentina and Uruguay. The general spread in latitude can be stated as between 30° North and 30° South, with slightly more-poleward extensions in the United States, Barbary, China, and Brazil.

As manioc is grown primarily for home consumption and most of the tropical areas of production keep no

Typical pile of manioc, ready for processing.

statistics on it or keep figures representing industrial rather than total production, present acreage and production are difficult to determine. However, it is commonly assumed that both Asia and Africa now exceed the Americas both in acreage and tonnage of manioc. This easily cultivated plant, which can produce more food by weight per unit of area than any other, has become a traditional and necessary element in the diet of millions of Africans, East Indians and other peoples of the Old World, while it has maintained its ancient position along with maize and beans throughout most of humid tropical America. In some countries manioc has a very high rank among the foodstuffs, such as first in Paraguay, second to rice in Madagascar, and vying with bananas, yams, rice, maize, sweet potatoes in the Congo and French West Africa. In Brazil, it ranks along with beans and rice and, in quantity consumed, is inferior only to maize. In recent years Brazil has attempted to subsidize the national manioc-flour industry and reduce the amount of imported wheat by requiring a mixture of

Starch plant building, on the Fazenda Santa Cruz, São Paulo. The entire plant, planned to produce ten tons of starch per day, cost about $60,000 early in 1941. Equipment, made in Brazil, was copied from European designs.

mandioca, maize, and rice flour with mixed wheat breads.

The leading producers of manioc (both by acreage and tonnage) are the Dutch East Indies, Brazil, Madagascar, and French West Africa, followed in uncertain order by such areas as Belgian Congo, Hispaniola, British Malaya, British East Africa, Nigeria, and French Indochina. Until the Japanese conquest, the Dutch East Indies dominated the export field, followed distantly by Madagascar, British Malaya, Indochina, Brazil, and the Dominican Republic. The chief importer has been the United States, followed by the British Isles and France.

The United States imported its manioc products chiefly from the Dutch East Indies, and the loss of the Asiatic supply has caused a search for other sources or substitutes. Some development of substitutes from waxy maize and certain sorghums has been made in the central states, but such substitutes are neither as cheap nor as satisfactory as manioc. Manioc is the cheapest known source of starch. It will produce from 40 to 100 metric tons per hectare, and, since the normal flour yield is one-fourth the weight of the root, one hectare can feed 30 to 70 people.

In these days of better relations (both trade and cultural) among the peoples of the western world, we can expect an increase in supplies of manioc from the American tropics.

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Reading ABOUT THE AMERICAS

The New World Guides to the Latin American Republics, Earl P. Hanson, ed.; Volume I; Duell, Sloan and Pearce, New York, 1943. Designed to present reliable travel information and background material on each of the Latin American republics, the exceedingly valuable guides in this volume cover Mexico, Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, Panama and the Canal Zone, Cuba, Haiti, the Dominican Republic, and Puerto Rico. A second volume is to be devoted to the countries of South America.

Each national guide includes a brief historical summary and description of the country in question, maps, a section of practical information for the would-be tourist, a regional guide, and an index of place names. Occasionally further descriptive sections are also included on such topics as art and architecture, and Indian life.

These guides to the countries are preceded by eleven brief sections covering: Latin America's Cultural and Historic Foundations; Latin American Art; Bibliographic Notes; Maps; The Pan American Union; The Travel Agent; Principal Catholic Holidays; Educational Opportunities in Latin America; The Pan American Highway; Mountaineering; Weights and Measures.

Chile, Erna Fergusson; 341 pp., map, index, illustrations, Alfred A. Knopf, New York, 1943. An interesting interpretation of a great nation. Written by a sympathetic and experienced Latin American traveler, this book describes Chile and explains why the country is what it is. The book is of timely interest to the Americas because of an analysis of Chile's German settlements and the description of an important wartime economy; it is especially useful to the United States because of its authoritative statement of Chilean opinion about its northern "Good Neighbor." The volume is illustrated with 35 beautiful photographs and a map.

Latin America. Countrysides and United Regions, Robert S. Platt; 564 pp., maps, photographs, and index; Whittlesey House, McGraw-Hill Book Co., Inc., New York-London, 1943. Written by a man who for over 20 years has pioneered in photographing, mapping, and interviewing people of the lesser known regions of Latin America—and chiefly of the rural regions which are usually neglected by the average tourist and writer—this book describes what Latin American life is really like to the majority of the Latin American population. It deals briefly with each country and then gives representative sketches which "record fundamental details that seem to give character to regions."

Rumos da Lavoura no Estado do Espírito Santo e Culturas Tropicais na Bahia, Gregorio Bondar; Instituto Central de Fomento Econômico da Bahia, Boletim no. 10, Tipografia Naval, Bahia, 1942. On the invitation of the State Government, Doctor Bondar, an expert on tropical cultures in northern Brazil, made a survey of the central and northern parts of the State of Espírito Santo. This bulletin brings together the results of the survey in the form of suggestions as to crops that the State should develop or introduce to further its economic position.

As Cêras no Brasil e o Licuri (*Cocos coronata* Mart.) *na Bahia*, Gregorio Bondar; Instituto Central de Fomento Econômico da Bahia, Boletim no. 11, Tipografia Naval, Bahia, 1942. Most of us who are concerned with the economic plant products of Latin America know at least a little about carnaúba wax which is obtained from the leaves of the palm, *Copernicia cerifera*, but of another wax producer, the licuri, we have heard little although now its wax is rapidly becoming an important article of export. This coconut palm, native to the Brazilian states of Baía, Sergipe, Alagoas, Pernambuco, and northern Minas Gerais has had the misfortune of bearing a confusion of common names under various of which its products have reached the export market. Perhaps the best known of these names in North American industry is uricuri, under which both the edible oil from the nuts and the wax from the leaves have been marketed. The author suggests that the common name licuri, widespread in Baía, be used when speaking of this particular palm to avoid confusion. Doctor Bondar, who was responsible for establishing the true identity of this valuable plant resource, has given us in this excellent treatise all that is at present known about the licuri as a source of wax as well as the results of his investigations as to its physiology and culture. The paper is prefaced by a discussion of waxes.

Penão (*Cnidoscolus marcgravii* Polh.). *Novo recurso oleífero da Bahia*, Gregorio Bondar; Instituto central de Fomento Econômico da Bahia, Boletim no. 12, Tipografia Naval, Bahia, 1942. The penão (*Cnidoscolus marcgravii*) is a Brazilian tree belonging to the family Euphorbiaceae which grows in abundance in the forests of the states of Espírito Santo, southern Baía, and probably also in Minas Gerais. The tree produces a heavy crop of nuts, the kernels of which look like almonds and since early colonial time have been used as food and as a source of cooking oil by the natives of southern Baía. Investigations show that the oil belongs to the important drying-oil type and that it is quite similar to soybean oil. The author points out that Brazil has in this plant a valuable resource at present little known or exploited. As a cultivated plant it could be grown for its drying-oil in areas too tropical for the better known tung tree. Recently the wood has been used in North America for insulating material in the refrigeration industry.

ALONG THE *Agricultural Front*

▲ New Scientific Society Founded

Foundation of an Inter-American Society of Anthropology and Geography is announced. The objectives of the Society are: (1) the interchange of information and views among scientists interested in the cultures of the Americas; (2) the formulation of research problems and the development of scientific methods and objectives in anthropology, geography, and related social-science research in the Americas; (3) the promotion of inter-American cooperation in these fields; (4) the encouragement of publication. Present plans also call for affiliation with similar societies already established in Latin America.

The Society will publish a quarterly review, the first number to appear early in 1943.

Information on membership may be obtained from Ralph L. Beals, at the Smithsonian Institution, Washington, D. C.

▲ Soil Conservation Progresses in Argentina

Señor Antonio Arena, Chief of the Division of Soils of the Ministry of Agriculture of the Argentine Republic, came to the United States in August of 1942, on an official study mission for his Government.

Under the supervision of Señor Arena since its creation in 1939, the

Señor Antonio Arena

Division of Soils surveys, analyzes, and classifies the soils of Argentina; it studies their fertility, conservation methods, management and ecological properties in relation to plant and animal nutrition. Conservation of soil and water and the agronomical problems of irrigation and reclamation are of paramount interest to the Division. In 1940 a special bill was introduced by the Ministry of Agriculture to develop a comprehensive program in soil conservation and fertility.

During his trip through the United States, Señor Arena was specifically interested in the organization and work done by the Soil Conservation Service of the United States Department of Agriculture. Methods used by the Soil Survey Division in the Bureau of Plant Industry, Soils and Agricultural Engineering, as well as the investigations of soils and related problems conducted by various universities and colleges, were studied. Señor Arena was also interested in the reclamation of soils in irrigation districts.

He visited soil conservation districts, particularly those in the middle west where the ecological conditions are similar to those in Argentina.

In Washington Señor Arena attended the meeting of the Pan American Soil Conservation Commission as delegate of Argentina. In St. Louis he attended meetings of the American Society of Agronomy and the American Society of Soil Science. After study of the relation of soil fertility to citrus production at the Citrus Experiment Station at Riverside, California, Señor Arena left for Argentina.

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Latin American Gifts

THE POTATO

by E. E. EDWARDS

The early history of the travels of the potato from its original home to practically all cultivable regions of the earth is involved in so vast a number of conflicting legends that the serious investigator of the subject is much tempted to seek refuge in the dictum of Mark Twain—"It ain't so much what you don't know that matters, as knowing so much that ain't so."

In the United States and other English-speaking countries the *Solanum tuberosum* is commonly called the "Irish potato," or simply the "potato." The plant is, however, only a potato by analogy and Irish by adoption. According to botanists, the true potato is the *Ipomoea batatas,* the plant now called the "sweet potato." It belongs to the Morning Glory family, whereas the Irish potato is a Nightshade. So far as the logic of biology and etymology are concerned, the word "potato" is no more applicable to the plant than the "dog" in prairie-dog or the "pig" in guinea-pig.

There have been several schools of opinion concerning the locality where the potato originally grew in a wild state. Probably, however, the potato is a native of the Peru, Ecuador, Bolivia, Chile region of South America. The late W. E. Safford reported the finding of mummies and of dried potatoes and funeral vases of terra cotta in the form of conventionalized potatoes in a succession of cemeteries along the arid Pacific coast of Peru and North Chile. Possibly it was farther south, in Chiloé, that the potato became acclimated to the wet, lowland climate which later made it a success in Ireland.

This South American gift to the world's food supply reached the United States by way of the Old World rather than directly. And it was in the Old World that it became "Irish."

There are many stories concerning the introduction of the potato into the countries of Europe, but the lack of exact and extensive historical records makes extremely difficult the task of segregating probable fact from purest fiction.

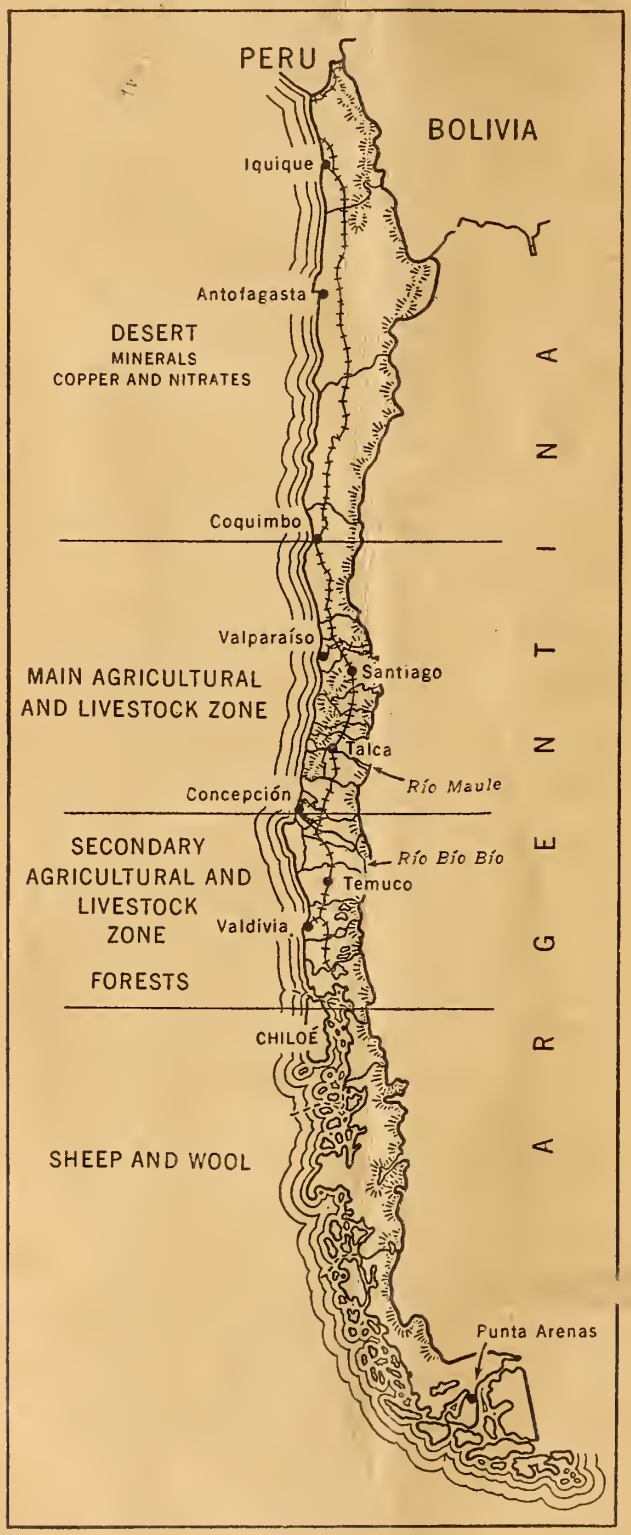
A focal point for many of the legends concerning the introduction of the potato is the heroic statue of Sir Francis Drake on the principal street and market place of Offenburg in Baden, Germany. The right hand of the figure representing Drake clutches a potato plant with tubers, and a decorative frieze at the base of the statue consists of carvings representing potatoes. The inscriptions represent Drake as the disseminator of the potato in Europe. His actual connections with the plant remain obscure.

But regardless of who first brought the potato to European and other shores foreign to its mysterious native Andean habitat, it is evident that the necessities of famine and war, rather than royal decrees or the antics of its advertisers, made of the potato the staple food of the common people.

CHILE

Land

Pressed between the Andes and the sea, Chile has an average width of only 110 miles. Its coast line of over 2,600 miles extends from the tropics to the southernmost point of the continent. The total area, approximately 286,000 square miles, falls into three distinctive geographic divisions—Northern, Middle, and Southern Chile.



Climate

Chile has nearly every variety of climate. The northern desert is hot and one of the driest places on earth; Southern Chile is wet, windy, and cold. Between, lies Middle Chile with a Mediterranean climate of mild, wet winters and cool, dry summers.

Population

Chile's population—officially estimated at 5,023,539—lives mostly in Middle Chile, the agricultural center of the country. Only about 1 percent lives in the South; the rest belong to the North.

Agriculture

Although Chile is primarily an agricultural country, it is best known for its mineral resources—nitrates, copper, coal, and iron. Agricultural products have not been among the leading exports, but for the most part the country's farms have fed the country's people, and agriculture is their main occupation.

Yet the agricultural area of the country is largely limited to the central valley of Middle Chile, and only about 37 percent of the total land area is agricultural land. The predominant use of land is pastoral—either directly as pasture or for feed crops. In southern Middle Chile the farms are devoted chiefly to the raising of livestock. In the far South, the chief activity is sheep raising.

Of the food crops raised in the Central Valley, wheat is of first importance. In southern Middle Chile, less than 20 percent of the total area is devoted to food crops. On this area, however, is produced an important share of Chile's wheat crop—generally the soft wheat which is adapted to the rainy conditions of the climate. In addition to wheat, the southern crops include potatoes, oats, apples, and hay.

In 1938, Chile's 10 leading agricultural and pastoral commodities, in the order of their importance, were wheat, beef cattle, wines and beers, potatoes, beans, barley, sheep, wool, hogs, and oats. During the five years from 1935 to 1939, fruit exports represented approximately one-tenth of Chile's total agricultural exports. Other valuable commodities were lentils, corn, rice, peas, and tobacco.

Forests

In spite of forest wealth, particularly in the South, Chile does not have a large lumber industry. Lumber is still imported, while the forests are utilized in small local industries, or burned to make room for pastures or crops, or used for fuel.

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Agriculture in the Americas

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UNITED STATES DEPARTMENT OF AGRICULTURE

IN THIS ISSUE

June 1943

NAMES & NEWS

Transfers of personnel in the Department are indicative of increased recognition of the importance of agriculture in our international relations. *Robert L. Pendleton* has been named Director of the experiment station in Nicaragua; *Samuel H. Work* will be Animal Husbandman; *Paul Guest,* Horticulturist; and *Arthur G. Kevorkian,* Pathologist. The cotton gin expert, *Charles Bennett,* has also been assigned to work in Nicaragua.

James M. Watkins has joined the staff at the station in El Salvador, as Agriculturist; *Frederick L. Wellman* is Plant Pathologist. After conducting rotenone studies in Peru, *E. C. Higbee* returns to Nicaragua to serve as Agriculturist.

Other scientists assigned to Peru are *H. J. Brooks,* Animal Husbandman, and *William E. Martin,* Senior Agriculturist.

Ross E. Moore, Assistant Director in charge of Latin American Relations, Office of Foreign Agricultural Relations, and *James Mersereau,* of the Export-Import Bank and Director of the Ecuadoran Development Corporation, went to Quito, Ecuador, in April to attend the meeting of the Board of Directors of the Corporation. In general, the business of the meeting was to consider projects for the development of strategic materials. One such project involves the procurement of rubber and wild cinchona bark through the establishment of trading posts. Trade goods for this purpose have already gone forward from the United States.

When *Ralph Allee* returned in March from Central America, he reported that the agricultural experiment station programs in El Salvador and Nicaragua were well under way.

In El Salvador, the station location has been changed from Zapotitán to San Andrés, which is on the Pan American highway, 32 kilometers north of San Salvador. Pre-Mayan ruins, which have been excavated by Tulane University, are on the site of the new institute. The Government of El Salvador has allocated 595 acres of land, a half of which is irrigated by gravity water. The buildings planned by the Department of Agriculture architect, *Frank Morris,* include an administration building (with conference hall, library, offices, and laboratories), animals unit, shops, residences for the staff, and buildings for a farm school for 80 boys. El Salvador has already appropriated funds to carry that country's share of the program.

San Andrés will also be the site of a new village to be established by the unique Salvadoran institution, known as Social Betterment, Incorporated, an organization conducted for the financial profit of its members as well as for social progress. The experiment station will thus be concerned not only with agricultural investigation, but with research in methods of rural resettlement, including public health and other phases ot social organization.

The chief agricultural interests at the station at present are projects on derris, roselle nber, and, at a higher altitude site near by, cinchona.

Dr. Robert L. Pendleton, Dr. Paul Guest, Dr. Arthur Kevorkian, and *Dr. S. H. Work* are already at the experiment station at El Recreo, Nicaragua. The station buildings have been planned on the site, and complete constructions are being worked out by the section of plans and services of the Bureau of Plant Industry, Soils, and Agricultural Engineering. The staff of the station will consist of five North Americans and a considerably larger number of Nicaraguans. Main projects of interest are derris and the processing of coconuts.

Agriculture IN THE *Americas*

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Agriculture In War

From their origin in a basic scientific interest, the inter-American activities of the Department of Agriculture have been intensified under the impact of the war and expanded to include cultural and economic factors in relation to agriculture.

by WAYNE D. RASMUSSEN

The farmers of the New World have drawn closer together. The first year and a half of the present war has brought to the Americas a mutual realization that cooperation offers the best assurance of winning the war and the peace. The furthering of such cooperation has become a primary objective of the United States Department of Agriculture.

The history of the relations between the Department and the nations of Latin America is a long and honorable story of an interchange of plants, ideas, and scientific missions. Even as early as 1847, the section on agriculture of the annual report of the Commissioner of Patents carried its accounts of South American agriculture. Such long-continuing interest is one assurance to Latin America that the present activities of the Department were not brought about entirely by the war and that the relationships will continue long after the war is over.

Surpluses and Commodity Agreements

Every farmer knows that great surpluses of certain agricultural products have existed in the past and that they will plague us again if steps are not taken for their control. Emphasis upon an increased production of complementary crops will help solve the problem. But other measures are necessary.

For several years the Department of Agriculture has given considerable attention to the problem of surpluses. When the Axis war machine rolled over Europe, the possibility of an Axis economic penetration of Latin America through barter and the play of surplus-producing areas one against the other first led to a proposed unification of hemisphere selling through inter-American cartels. This proposal was not adopted.

Then attention was turned to the development of commodity agreements to control surpluses. One of the first such agreements in which the United States participated was the London Sugar Agreement, approved by delegates of 22 major sugar-producing and consuming countries on May 6, 1937.

On November 28, 1940, the Inter-American Coffee Agreement was signed by 15 nations. This Agreement allocated the United States market among the various producing countries, provided for limitation of production, and authorized the Coffee Board to maintain coffee prices at reasonable levels.

The Commodity Credit Corporation has taken steps toward aiding control of the hemisphere cotton surplus through surplus purchase and acreage-reduction agreements with Peru, Nicaragua, and Haiti.

As a result of discussions begun on July 10, 1941, by representatives of Argentina, Australia, Canada, the United Kingdom, and the United States, a Memorandum of Agreement was concluded to help solve the world wheat surplus problem. It established the basis for a division of the international wheat market after the war among exporting nations and provided specifically for the immediate establishment of a pool of wheat for inter-governmental relief in war-stricken areas as soon as the international situation should permit.

Other such agreements are under consideration. In an address at the Second Inter-American Conference of Agriculture Leslie A. Wheeler, Director of the Office of Foreign Agricultural Relations, called attention to the cutthroat competition for available world markets which will ensue between exporting countries after the war if some international understanding does not absorb the principal agricultural surpluses or lessen their economic impact. By removing this major cause of friction among nations, international commodity agreements could con-

tribute significantly to the construction and maintenance of a durable peace.

Young bud-grafted Hevea rubber plants of high-yielding strains in a budwood multiplication area at the Department's field station at Tela, Honduras. After 9 months to a year, when the plants are 8 to 10 feet tall, the stems are cut back. Yard lengths are distributed to cooperating countries for bud-grafting in their local seedling nurseries. Then each budded plant may be further multiplied by an average ration of 20:1 per year.

Second Inter-American Conference of Agriculture

The United States sent 12 official delegates, headed by Secretary of Agriculture Wickard, to the Second Inter-American Conference of Agriculture, held in Mexico City from July 6 to 16, 1942. A number of consulting delegates also attended from this country. The main purpose of the conference was to orient hemisphere agriculture through the exchange of scientific ideas and the development of cooperative research.

Much of the scientific interest at the Congress turned to the problems of producing vital materials, of which there is shortage in the hemisphere. Experts discussed the value of different crops in the hemisphere economy, suggested better methods of production, analyzed economic factors involved in increased production, and passed a series of resolutions aimed at promoting accomplishments.

Complementary Products

During the first year and a half of war, relations between the Department of Agriculture and the Latin American nations have centered upon the increased production of goods necessary to the war effort. Japan conquered the area which had supplied 90 percent of our peacetime rubber needs and appreciable amounts of certain fibers, fats and oils, drugs, spices, and other products mainly of tropical origin; shipping shortages made it imperative that we obtain necessary imports as near home as possible. The Department extended all possible scientific and economic assistance to Latin America in order to obtain these products. It also worked with other agencies of the Government which were interested in this program. In fact, the Department's staff of scientists, economists, and administrators served as a source of manpower for some of the other agencies, and the "nonpaying" scientific work of the Department on problems of tropical agriculture and on Latin American agricultural conditions has been of inestimable value to the Nation in getting the new programs under way.

Rubber

One of the most important of the programs in which Department scientists demonstrated the value of their previous research was the program of increased production of cultivated tree rubber in Latin America. Fortunately, since such production is a long-time undertaking, the program was begun on June 22, 1940, when Congress appropriated $500,000 for the work. During the pre-war period, survey parties investigated sites for rubber production; aid was given in establishing rubber experiment stations in Latin America; promising high-yielding clones were procured from the East Indies. By December 7, 1941, over 10 million rubber tree seeds had been planted as part of a cooperative program, and a final shipment of 5,500 budded trees from the Philippines had safely reached American shores.

During 1942, the Department continued to carry on research and to distribute seeds and budded stumps. The number of demonstration plantations in Latin America was increased, and small farmers were encouraged to grow rubber. Most of this work was undertaken cooperatively in accord with agreements between the United States and various Latin American countries.

In evaluating the work now being done to promote the cultivation of rubber in Latin America, it should be remembered that the program is of long-range significance. The work involves the establishment of high-yielding and resistant clones and also the adaptation of cultural practices and plantation and farm systems to the Latin American environment, which differs in important respects from that of the East Indies. No appreciable amount of cultivated rubber can be secured from Latin America for at least 5 years.

Other Complementary Crops

Other crops which can be grown on the American Continent both to help the war effort and to bolster the economies of American Republics in the peace to follow, are vegetable fibers, rotenone-bearing roots, tea, vege-

table oils, and cinchona for quinine. To promote a long-time program for the cultivation of these and other crops which do not compete with those grown in the United States, this country has signed agreements with Ecuador, El Salvador, Nicaragua, and Peru to establish cooperative experiment stations.

Under each of these agreements, the United States furnishes technical assistance as well as scientific equipment and publications available only in this country. Usually the first Director of each station is a citizen of the United States. The other Republic provides the necessary land, buildings, transportation facilities within the country, equipment and publications not available in the United States, and associate technicians to work with those of the United States. It is also stipulated that the other Republic send a number of agricultural specialists for advanced training in colleges and universities of the United States, so that they may eventually take over the management of the stations.

In addition to those already signed, preliminary agreements have been drawn up with Colombia and Bolivia for the establishment of similar stations. Several other countries have requested such cooperation.

Early in August 1941, a step toward increased production of complementary products in Haiti was taken by the formation of a Haitian corporation to enable the Haitian and United States Governments to cooperate in the long-term agricultural development of the country. Similar corporations have since developed in Ecuador and Bolivia.

Inter-American Institute of Agricultural Sciences

On October 7, 1942, the Governing Board of the Pan American Union determined the establishment of the Inter-American Institute of Agricultural Sciences in Costa Rica, with Earl N. Bressman, a former Department of Agriculture staff member, as director. The outgrowth of a proposal to the Eighth American Scientific Congress in 1940, the Institute will give impetus to the development of cooperative agricultural research. On March 19, 1943, it was inaugurated by Vice President Henry A. Wallace.

Adjoining the United States Department of Agriculture's Costa Rican Rubber Experiment Station, the site offers an opportunity for research in most types of tropical agriculture and land use. The Institute is to be managed by a corporation, the directors of which will be

Courtesy of the Pan American Union.

A group of the trainees who have worked with the Bureau of Agricultural Economics and the Soil Conservation Service. Dr. Leo S. Rowe, Director General, welcomes the students at the Pan American Union.

the members of the Pan American Union Governing Board. It is planned that the facilities of the Institute will be used cooperatively by all the American Republics.

Cultural Cooperation

In addition to its loan of technical assistance and to aid in the solution of economic problems, the Department of Agriculture has increased the attention given to the more purely scientific and cultural aspects of the "Good Neighbor" policy. The bringing of a group of outstanding young Latin American engineers to spend a year in study of the methods and techniques of the Rural Electrification Administration in 1941 was an important forward step in this direction. The Office of the Coordinator of Inter-American Affairs made funds available for the project.

During the first year of the war, this program of bringing Latin American students to the Department was expanded to include the Bureau of Agricultural Chemistry and Engineering, the Bureau of Agricultural Economics, and the Soil Conservation Service. Several other bureaus made their training facilities available to students and visiting officials. The Office of Foreign Agricultural Relations coordinated the programs and acted as a liaison office with other interested Government agencies.

Inter-American acquaintance has been furthered in other ways. Many rural communities in the United States acquired some knowledge of Latin Americans either through the Pan American fiestas which were sponsored by local groups with the cooperation of the Agricultural Adjustment Administration, or by such temporary migrations as the Mexican migration which relieved the farm labor shortage in the United States in 1942.

Scientific Cooperation

Scientific cooperation between the Department and agencies and individuals of several Latin American countries continued in 1942 along lines already established. In some cases, greater use was made of the Department's facilities, because the war made impossible any normal intercourse between the scientific institutions of Latin America and Europe. For example, many fungus collections which would ordinarily have gone to Kew, Paris, or Berlin, were diverted to the herbarium of the Bureau of Plant Industry for identification.

The Mexican Government completed the construction of new laboratories in Mexico and turned them over to the Bureau of Entomology and Plant Quarantine for use in the cooperative investigations of fruitflies. After the United States entered the war, emphasis was shifted to the development of methods for sterilizing possibly infected products so that their wide movement without danger would be possible.

The Bureau of Entomology and Plant Quarantine continued to carry on the exchange of parasites of agricultural insect pests. Such exchange works both ways. For instance, the Bureau aided in the establishment of a Fiji parasite of the banana weevil in Honduras, and during the year it received beneficial insects from several Latin American countries.

The State experiment stations have carried on projects for exchanging seeds, plants, and scientific information with various institutions in Latin America. During the past year the Office of Experiment Stations materially increased the coverage of Central and South American publications in the *Experiment Station Record*.

Also during 1942, the Department sent several agricultural missions to Latin America, and several of its personnel were given leaves of absence or transferred to other agencies in order to work in Latin America. The purposes of the missions varied: some made general surveys of agricultural production in particular areas; some surveyed the possibilities for the production of specific commodities; others had the definite purpose of encouraging the production of vital complementary products.

Purchase of Complementary Products

For efficient expansion of the production of vital complementary products, there must be a system for their purchase and importation into the United States. Purchase contracts made even before the commodities are produced may be an instrument for securing such increase in production during the war period. In May 1942, the Board of Economic Warfare issued a directive designating the Commodity Credit Corporation as the exclusive agency for the negotiation and conclusion of all imported materials contracts for most agricultural commodities. Under this power, the Commodity Credit Corporation made agreements with several Latin American countries for their entire exportable surpluses of certain vital products.

Steady Growth of Inter-American Relations

Year by year the Department of Agriculture has increased its activities in the field of inter-American relations. From their origin in a basic scientific interest, these activities have been intensified by the impact of the war and they have been expanded to include cultural and economic factors in relation to agriculture. Since the economies of the Latin American nations are largely agricultural, these relationships should continue to flourish as the American nations, and American farmers, draw closer together.

Tingo María

The first of a series set up in the other American Republics with the cooperation of the United States, the Tingo María agricultural experiment station attacks problems incident to the increased production of necessary crops.

by R. E. MOORE

On April 22, 1942, the Governments of Peru and the United States entered into the first agreement for the establishment of a cooperative experiment station in the Americas. The station for which this agreement provided is located at Tingo María, on the eastern slopes of the Andes, at about 2,200 feet above sea level.

The objective of the station—as of the others already set up or being planned—is to help improve the economic condition of the country in which it is situated, through the encouragement of increased production of rubber, quinine, and other products formerly imported in sizable quantities from non-American sources. Peru has the soil and climatic conditions for cultivating insecticide plants, vegetable oils, abacá and other rope fibers, kapok, some hardwoods, and tea; it is hoped to undertake considerable work in those products.

According to the agreement signed by the two Governments, Peru makes available all the land needed for conducting investigations and the demonstration work designed to promote profitable production of such export crops as those already mentioned. The Peruvian Government also agrees to build residences for both Peruvian and United States staff members; laboratory, office and library buildings for technical work, as well as service buildings of various types. Peru will also supply such furnishings and equipment as may be obtainable in Peru; an adequate, pure water supply; recreational facilities; medical personnel; necessary books and periodicals other than those issued in the United States; funds for station publications; the services of technologists, clerks, mechanics, and unskilled labor; and transportation within Peru. Most important of all, the Peruvian Government undertakes to supply a minimum of one Peruvian agriculturist to work in association with each agriculturist supplied by the United States Department of Agriculture, and when possible, to maintain Peruvian students in graduate study at United States colleges or universities in each field of agriculture.

The Government of the United States agrees to provide scientists to function in the posts of director, agronomist, plant geneticist and breeder, pedologist, animal husbandman, rubber specialist, and agricultural extension specialist. The United States will also furnish current scientific journals on plant and animal science, published in the United States; scientific apparatus and equipment not produced or manufactured in Peru; stoves and refrigerators for staff residences, not available in Peru; tools; hospital equipment for treating emergency cases; and services connected with the designing of all buildings, including residences for Peruvian and United States staff members.

The affairs of the cooperative experiment station at Tingo María are handled by a Governing Commission composed of one representative from each of the various

Architect's drawing of the administration building at Tingo María.

countries. The United States Department of Agriculture provides the services of an executive secretary to assist the Governing Commission. This Commission has general responsibility for governing the station, but, in accordance with a provision of the agreement, it has delegated direct supervision to a director.

The acting director of the station is Dr. Benjamin J. Birdsall, who arrived in Peru on July 31, 1942. Dr. Birdsall is a 1929 graduate of the University of Wisconsin's agricultural school and has spent seven years as soil chemist, agronomist, and plantation manager in Colombia, Costa Rica, Honduras, and Panama. In 1941 he was a member of the Ecuadoran Economic Resources Commission.

Associated with Dr. Birdsall are Dr. William E. Martin, Senior Agriculturist; Mr. William Wickline, Associate Agriculturist; and William C. Cooper, Agriculturist. Mr. Wickline was formerly in the United States Government service as an entomologist and in plant quarantine work. As rubber expert, there is Dr. Rolland Lorenz, who was formerly identified with the Firestone Co. in Africa. Dr. Lorenz took part in one of the rubber surveys in tropical America during 1940. Another member of the staff who has gone to Peru from the United States is Dr. Harold Jerome Brooks, animal husbandman.

These United States technicians cooperate closely with such interested Peruvian officials as Pedro Recavarren and Pedro Beltrán.

The grounds set aside for the station buildings cover an area of about 11 acres, along the Central highway of Peru. They are located about 260 miles from Lima, within the township of Tingo María, on the Huallaga River. Other land is being acquired for experimental purposes, and the Government has set aside 2,250,000 hectares of land from the Quebrada Caracol, south of Tingo María, to Pucallpa, on the Ucayali River, for colonization. This land has been divided into large, medium, and small parcels; only Peruvians may hold the medium and small tracts. There is also a project looking toward a belt of cultivated farms and settlements along the entire road to the Ucayali.

The Tingo María-Pucallpa section is a very rich and unusually diversified agricultural region, affording great variation in altitude, soils, and climate. Such widely different crops as bananas, cacao, coca, corn, cubé (an insecticidal plant), peanuts, pineapples, quinine, rubber, rice, tea, tobacco, and yuca, may be cultivated. The climate is reported as ideal. There are no endemic diseases, and malaria does not occur. The nights are cool, though at noon the temperature reaches 95° F.

The building program of the station includes three main buildings and 20 residences. The "head" house is to accommodate the greenhouses and central laboratories. An administration or main building is to contain offices, library, and a dormitory for the unmarried staff members. By the end of 1942 a brick plant and carpenter shops had been installed, and the foundation for the "head house" had been completed.

Several projects were initiated in 1942 at Tingo María. The station took over the Hevea rubber nursery which had been started in 1941 under Señor Manuel Sánchez de Aguila. This nursery comprised about two acres of prepared land, about 900 seedlings from 1941 seed, 3,000 seedlings from 1942 seed and several budded stumps, which the Bureau of Plant Industry's Division of Rubber Plant Investigations had furnished to the Peruvian Government. About three acres of new felled woodland were prepared for the 1943 seed. Some 700,000 rubber seeds were sent by plane from Mexico, but due to transit delays, only a small portion of these seeds are expected to produce vigorous seedlings. Two other rubber nurseries, one at Oromina, on the Huallaga River near Yuramaguas, and the other near Iquitos, have been taken over.

For cinchona culture, a site was chosen on the Tingo María-Pucallpa highway, about 30 miles from Tingo María. Labor quarters have been built, and germination beds started. Some seed from the Merck and Company holdings in Guatemala, and seedlings from the United States Department of Agriculture nurseries at Glendale, were received.

In connection with the insecticide, rotenone, a quantity of derris cuttings were received from the United States Department of Agriculture Puerto Rico Experiment Station in Mayagüez. Other crops are being considered for study, too. Among these are abacá, cereals, vegetables, edible oils, yam-beans, and upland rice.

A cooperative livestock project is also planned. Problems of introduction, breeding, pasture crops, supplementary feeding, management, diseases and pests, will come in for study.

Some attention is being given to soil surveys, soil management and land use, botanical studies, and forestry and nursery projects for selected tree species which are considered valuable for reforestation.

The material benefits to be derived from the activities outlined above obviously cannot take definite shape in an impressive way for many years to come. Yet this very fact emphasizes the new spirit of practical inter-American cooperation in the solution of common problems that is fast becoming the guiding force in our relations.

Until only a few years ago, Tingo María was considered to be "in the middle of nowhere." Today Peruvians look upon it as the center of a vast movement comparable to the settling of the Old West in the United States.

The example set by the agreement signed between Peru and the United States has started a series of similar undertakings. Already, there are stations in four other American Republics.

The New Chilean Nitrate Industry

An account of the contribution of E. A. Cappelen Smith and of his associates to modern progress in processing caliche, the source of sodium nitrate, long the world's chief nitrogenous plant-food carrier.

by CHARLES J. BRAND

Sodium nitrate is of vital importance as a plant food and as a war material. South America is its greatest producer; North America, its greatest user. Caliche, the natural ore which is the source of sodium nitrate, comes from Chile. It constitutes around 20 percent of that nation's total exports. It gives direct employment to possibly 50,000 persons, and indirect work to many more. Quite probably the welfare of one-tenth of Chile's total population of 5,000,000 people is affected by the nitrate industry. And the great importance of sodium nitrate to the world is reflected by the fact that since the small beginning of the industry in 1831, Chile has shipped out approximately 107,000,000 short tons.

A man who made an effective contribution to this Chilean industry is E. A. Cappelen Smith. The number of men living at a given time who are privileged truly to add to the well-being of the race is woefully small. Too often those who have so contributed are unknown to those who in the passing of time have benefited from their work. Often, too, they remain unsung even by those who know the facts and could spread them abroad. Happily, Cappelen Smith is receiving just recognition while he is still alive.

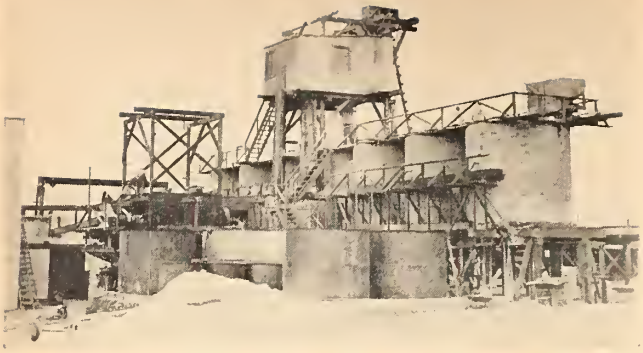
Elias Anthon Cappelen Smith was born in Norway in 1873. He came to America as a young man after graduation from the Technical College of his native city of Trondheim and settled in Chicago. Interestingly enough, his first job in the New World was that of assistant chemist with Armour & Co. at the very time (1893–95) when Dr. Charles H. MacDowell was organizing the fertilizer department of that company. Then organic substances, particularly packing-house wastes and byproducts, were still important raw materials to the growing commercial plant-food industry.

Many years later, during World War I, MacDowell was director of the Chemical Division of the United States War Industries Board. As such he was a predominating factor in forming and carrying out our national policies regarding sodium nitrate, particularly as to allocation for war and civilian industry uses. In World War II sodium nitrate from Chile is again playing an important role both as a plant food and as a war material. In 1941 we imported about 800,000 tons of Chile's total exports of about 1,400,000 tons of sodium nitrate.

Chilean Ambassador to the United States Rodolfo Michels (right) confers the decoration of Knight of the Order Al Mérito on E. A. Cappelen Smith at a luncheon in New York given in his honor by the Ambassador on February 25, 1943. This is the highest civilian award presented by the Government of Chile.

It was the depression that prevailed in Chile during and after the first World War which caused Cappelen Smith to turn his engineering ability to correcting the primitive technology of the nitrogen industry on the Antofagasta pampa.

In the past 25 years, chemicals from synthetic and byproduct sources have largely displaced natural nitrogen carriers, particularly the organic materials. Cappelen Smith himself, many years after his experience as a packing-house chemist and after a remarkable variety of intervening experiences culminating in his work as engineer at the copper mines at Chuquicamata, played a chief role in revolutionizing the production of nitrate on the Chilean desert. In an enterprise that involved such tremendous technical, financial, and political problems



Semicommercial pilot nitrate recovery plant at Oficina Cecilia, Chile, built about 1922, with a capacity of 40 tons of ore per day. Here the pioneering of the new process was carried out.

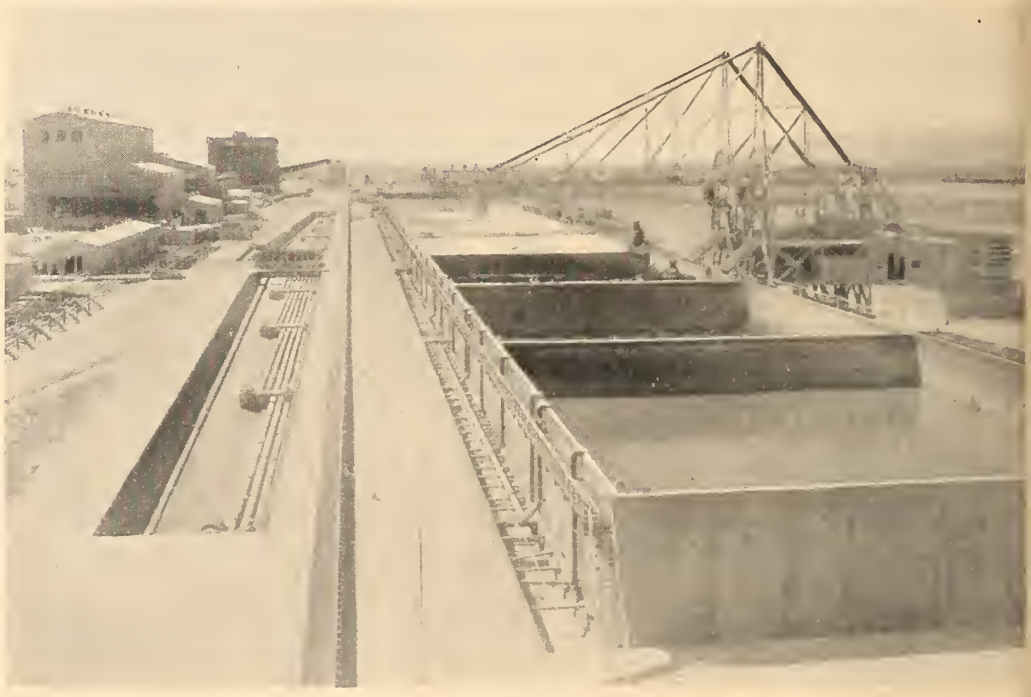
group attack backed by ample money, research, and engineering ability was necessary. Cappelen Smith's long experience with copper through his association with Guggenheim Brothers had convinced him that the backward technology of the nitrate industry could be greatly improved if the large-scale mining and leaching operations that had been introduced at Chuquicamata could be installed for the beneficiation of caliche.

With the help of a group of younger associates working under his leadership on the chemical and physical aspects, coupled with his own fine engineering experience in utilizing low-grade copper ores, the new Guggenheim nitrate recovery process was devised. It was so named because the brothers Guggenheim of New York had the faith and courage to advance the large sums necessary to carry on through a period of years the research and experimentation necessary to ultimate success. Their interest in the Chilean nitrate industry began in 1919, after a thorough survey had been conducted for them under the supervision of Cappelen Smith. After decades of crude mining and processing, the technology of the nitrate industry had been very primitive indeed until, in the early 1880's, J. T. Humberstone introduced the Shanks process. This process relies on very hot water for leaching liquor in the recovery process. No pronounced improvements were made from that time until the Guggenheim process was installed at the María Elena Oficina in 1926.

In 1919 an experimental plant had been put into operation at the Guggenheim Brothers research laboratory in New York. Prior to that, some rough leaching tests had been made in Chile in which an ice-cream freezer was used as the means of refrigeration for crystallizing the sodium nitrate from the leaching solutions. Some tests had also been made at Chuquicamata from nearby ores. The results of all the tests were sufficiently encouraging to result in the shipping of 50 tons of typical caliche to New York for thorough chemical, physical, and technological study.

The magnitude of the enterprise that resulted is reflected by the great investment it represents. Costs totaled approximately $70,000,000 for research, experimentation, construction of plants, subsequent changes, improvements, and additions; for purchase, electrification, and extension of the transportation system; for port facilities; for housing and other facilities for employees; and for other expenditures.

The chief assistants in developing the process where Paul H. Mayer, C. Lalor Burdick, now with E. I. du Pont de Nemours & Co., Dr. E. Stanley Freed, still chief chemist at Oficina María Elena, M. B. Littlefield, engineer on the Guggenheim staff, and Paul F. Kruger, who built the pilot plant and is now in charge of wartime



Leaching tanks, Guggenheim process, at Oficina Pedro de Valdivia of Lautaro Nitrate Co., Ltd.

minerals and metals exploration work in Brazil for the Board of Economic Warfare.

Others who should be mentioned in order that this brief story may convey a true picture of the cooperation and collaboration involved are Dr. Paul D. V. Manning, now director of research, International Minerals and Chemical Corporation; J. H. Drummond Ross, then a young engineer at Oficina Cecilia, now a lieutenant colonel in the Canadian Expeditionary Force; H. J. Skougor (now deceased), chief designing engineer at the María Elena plant, and his assistant, S. H. Apolant; Marciel Ernesto Martinez, now Mr. Kruger's chief assistant at María Elena; Robert Marsh, consulting mining engineer, who developed the methods of mining and electric transport now employed; George Gary, who was responsible for mechanical maintenance; G. Fred Coope, now president, Potash Co. of America, Carlsbad, N. Mex.; Louis Ware, general mine superintendent from 1926 to 1929, and now president, International Minerals and Chemical Corporation, Chicago; and Horace R. Graham, now first executive vice president of the Anglo-Chilean and Lautaro Companies.

With the introduction of mechanization in mining and processing operations, the Guggenheim process has greatly reduced labor requirements. On the other hand, it has led to the manufacture of useful byproducts, of which iodine is one.

As often occurs, the good work done in far-off countries by those who are not natives, and the contributions of other countries to ourselves, are not given proper credit.

Shanks process leaching tanks. This installation is at the Oficina Cecilia of Compañía de Salitrera de Tarapacá y Antofagasta.

Removing sublimed iodine from retort at Oficina María Elena of Compañía Salitrera Anglo-Chilena. Chile produces about 90 percent of the world's iodine, an important war medical material.

But the story of the modernization of the Chilean nitrate industry presents a fine example of mutual helpfulness between two Western nations. That Cappelen Smith's work has been appreciated by the Chilean Government is illustrated by the official decoration recently conferred upon him by the Chilean Ambassador, Rodolfo Michels.

This is not the first time Mr. Smith has been honored with a foreign decoration. In 1925 he was made a Knight Commander with Star of the Order of St. Olaf by the King of Norway. His contribution to the progress of nitrate technology is second only to his service in the field of improving large-scale copper-smelting methods. As copper and sodium nitrate are Chile's greatest sources of income, next to its agriculture, Cappelen Smith's work has been of tremendous service to Chile.

Agronomists estimate that a ton of sodium nitrate can be expected to produce 100 bushels of wheat, 140 bushels of corn, and more than two bales of cotton lint plus a ton of cottonseed. Such statistics suggest the value of Cappelen Smith's contribution to the maintenance of the Chilean nitrate industry under conditions effective for the defense and industrial progress of the continent.

While precise figures cannot be given, costs of production have been reduced so much that natural sodium nitrate continues to hold a real place in the sun which it could not have held had the whole dependence remained on the old Shanks process. The two great plants using the new process are working caliche that averages as low as 8 percent, while the Shanks process oficinas need to use ore averaging over 16 percent.

Assuming an average annual export of 1,700,000 tons, the rate that has prevailed for the last 5 years, the reserves in Chile will last about twice as long with the new process as with the old.

The guanay or Peruvian cormorant (left) is the most valuable wild bird in the world. Its excrement, called guano by ancient and modern Peruvians alike, forms the major part of the fertilizer deposits so indispensable to Peruvian agriculture. In the intestines of these birds, subtle biochemical processes transmute, into what has been called "the finest nitrogenous fertilizer known," between 750,000 and 1,000,000 tons of fish per year. It is estimated that Peru's guano deposits have been worth one billion dollars.

In the middle of the last century some of the 43 islands along Peru's coast were covered with a cap of guano nearly 200 feet thick. Unrestrained exploitation wiped out this accumulation and, since the early years of this century, guano production has been on a sustained yield basis. Wise conservation methods, on the part of the Peruvian Government, have doubled and redoubled the bird population. This accomplishment was hailed, by the Second Inter-American Agricultural Congress, as one of the most successful accomplishments in the history of wild-life conservation.

The enormous guano deposits result from the birds' habit of building more than three nests to the square yard (below). The nesting cycle lasts about four months, during most of which time both adults are on the island with their nest and young. Thus, most of the guano is caught for man's use. Even the part that falls into the sea is useful, since it fertilizes the marine plants that feed the fish on which the birds live!

Peru's Billion Dollar Birds

One of the most important guano producers is the Peruvian Brown Pelican, close relative of the familiar birds of Florida and California.

Intensive agriculture along Peru's desert coast has been possible for centuries by utilizing the riches of the cold Humboldt Current as a source of nitrates, phosphates, and other minerals. An approximate total of 11,000,000 birds, feeding almost exclusively on fishes, has provided as much as 168,000 tons of fertilizer in a single year at no cost except for collecting it, and protecting the birds. (Photos by William Vogt.)

On flat-topped islands, North American farm machinery—tractors, toothed and disc harrows—is used to loosen and break up the guano. The birds show little fear of the machinery.

The "Divine Plant" of the Incas

Coca leaves are of economic importance in two ways—as a source of the anesthetic cocaine and as a nonintoxicating stimulant on which the economic life of the Andean region largely depends.

by S. F. BLAKE

Coco, cocoa, coca, cocóa, cacao—what a set of names to befuddle the botanist on a Saturday night radio contest, or even, perhaps—although this is probably asking too much—to trip the tongues of the omniscient Quiz Kids.

Coco—the Spanish and Portuguese name of the coconut palm and of its fruit—said to be derived from the Portuguese *coco*, a bugbear, an ugly mask to frighten children, from the monkeylike face formed by the three germinal apertures at the base of the shell. Cocoa—the English name for the product obtained by roasting and grinding the seeds of the cacao tree and for the drink made from these seeds; also, commonly but uncommendably, the English rendering of the name *coco*, a usage attributed by Webster to an error of Samuel Johnson, the compiler of the first great English dictionary. Coca—the Spanish, now the all-but-universal, name of the Andean shrub *Erythroxylon coca* and of its leaves, the cud or "chaw" of the South American Indians; the name *coca* itself derived from the Incan *cuca* or *khoka*, meaning *the* tree, a plant so preeminent that no distinctive prefix was needed. Cocóa—the original pronunciation of the English cocoa; and cacao—the Spanish and now the accepted vernacular name for *Theobroma cacao* and other species of the same genus, the source of cocoa (the drink) and chocolate, a name itself derived from the Nahuatl *cacahuatl* or *cacahoatl*. And then there are cocoa butter and coconut butter and cocum butter, cocoa shells and coconut shells and cocoanut shells, coco wood and cocoa wood and cocus wood.

No wonder the botanist insists that botanical names are the only safe guides in such a concoctious world.

Natives Long Dependent on Coca

Francisco Pizarro and his followers, that intrepid and cruel little band of Spaniards who conquered the great empire of Peru in less than a decade in the early sixteenth century, found the practice of coca chewing universal among the natives. The conquerors sought nothing but sudden wealth. The natives were a despised and an infidel race, created to be slaves. What more natural than that any habit affording comfort to such children of darkness should be regarded as iniquitous and marked for extirpation? For many years both church and state sought to end the practice. During the rule of Francisco de Toledo, the fifth viceroy, some 70 ordinances concerning coca were issued. But in time it was realized that the enslaved natives, on whose labors their masters depended for their wealth, were equally dependent on a continuous supply of coca leaves for the strength to perform their tasks successfully, and the claims of self-interest overcame religious zeal. Coca leaves were rationed to the laborers in the Andes more or less in proportion to the severity of the labor required of them.

Description of Plant

What is this coca, the "divine plant" of the Incas? True coca (*Erythroxylon coca* Lamarck) is a branching shrub, up to 12 feet high, with small hollylike white flowers clustered in the leaf axils, red berrylike fruits, and thin entire leaves an inch or two long and varying from elliptic or oval to oblong or obovate. A peculiarity of the leaves is the fact that, in addition to the strong midrib, they possess on each side of the latter, nearer the midrib than the margin, a thin lateral line or false nerve that runs from the base of the leaf to the apex, cutting through the true lateral veins and veinlets of the leaf tissue. There are nearly 200 different species of *Erthroxylon;* they occur in the tropics of both hemispheres. Several species are used in medicine or as a source of dyes or as timbers. Many, if not most, species no doubt contain alkaloids more or less similar to cocaine, but the only commercially important species, aside from *E. coca*, is *Erthroxylon nocogranatense* of Colombia, which is cultivated in South America, the Cameroons, and perhaps elsewhere. *Erthroxylon coca* itself occurs in deep warm ravines in sub-Andean Peru, in Bolivia, and in Brazil, and is extensively cultivated in its general range in South America and in Java.

Coca leaves are of economic importance in two ways—as a source of the anesthetic cocaine and as a nonintoxicating stimulant on which the economic life of the Andean region largely depends. The leaves had been

chewed by the Incas for centuries, but the discovery of the usefulness of cocaine in producing local anesthesia was not announced until 1884. For many years cocaine has been much used for this purpose by dentists, ophthalmologists, and surgeons generally, but it is now largely superseded, at least among dentists, by novocaine and other synthetic products which possess various advantages such as low toxicity, nonirritability, and the possibility of sterilization by boiling. A related fact which need not concern us further here is the growth of the "cocaine habit," one of the most injurious common forms of narcotism.

When the discovery of cocaine and its properties was announced, it was not unnaturally assumed that the fatigue-dispelling effects of coca as used by the Indians were due to its content of cocaine. It is now known that this is not at all the case. Cocaine is a narcotic, whereas the chewing of coca leaves liberates energy for extreme and prolonged muscular exertion. When the late Dr. H. H. Rusby made a special study of the subject in Bolivia, he found that the natives selected leaves without regard to their content of cocaine, and he believed that the effects of coca chewing are due to various other substances which are in great part volatile and lost in exported leaves.

The practice of coca chewing is widespread among the natives from Colombia to Peru and Bolivia, particularly among the poorer classes of Inca descent and those living at higher altitudes. Although coca is exposed for sale in some of the larger cities of Chile, such as Valparaíso and Santiago, its use in that country seems to be confined to laborers who have come from Peru and Bolivia and brought the habit with them. Both men and women practice it.

Equipment for Coca Chewing

The equipment of the coca chewer consists of the *chuspa* or pouch, sometimes beautifully ornamented, in which the dried leaves are carried; the *poporo*, or small gourd in which is carried the *llipta*, a limy substance prepared by burning certain plants, bones, or shells, often mixed with a little lime; and a little stick which is used to carry the *llipta* to the mouth and is afterwards wiped on the top of the gourd, thus giving rise to a limy incrustation the size of which is proportional to the age of the owner, who never parts with his *poporo*. The Indian, slow and methodical in his coca chewing as in everything else, follows a definite ritual in preparing his chew. He takes some leaves from his pouch, separates the thin tissue of the blade from the midrib, and puts it in his mouth, adding some *llipta* from his *poporo* by means of his stick after the leaves have been sufficiently moistened and chewed. The ashy or limy matter thus added serves to bring out the flavor of the coca leaves. Thus refreshed, the Indian is ready for another stage of his journey as a pack animal or for another spell of work in the mines.

The use of coca in this manner, and the resultant replenishment of the worker's energy, are so definite in their results that is is customary to measure distances to be traveled by *cocadas* rather than miles; a *cocada* is the distance traveled before the need for another chew is felt. (One is reminded of Washington Irving's account of the worthy Dutch mijnheeren of New Amsterdam, who measured distances traveled by the number of pipes smoked.)

Coca Stimulates Native Workers

The amount of labor that can be performed by the natives under these conditions is astonishing. At high altitudes, where the air is thin, the very process of breathing consumes much energy, and the carrying of a load of eighty to a hundred pounds calls for much more. Yet the Indian porters travel six or eight *cocadas* a day on a couple of handfuls of coca leaves and take no food until evening. If food is not forthcoming, which is often the case, it is not at all unusual for a messenger, a *chasqui* or courier, to travel a hundred leagues with no other sustenance than coca leaves.

Forty years ago the average amount of coca leaves produced in South America in a single year was estimated

Branches of the coca plant, showing flowers, fruit, and the characteristic veining of the leaves.

at thirty to forty million pounds, of which 90 percent or more was consumed locally. Practically all came from cultivated trees.

The plantations in which coca is grown, known as cocales, are found in the Andes, especially on the eastern slopes, from Colombia to Bolivia, at altitudes up to 6,000 feet, and are usually comparatively small, from half an acre up. The young plants are set out a few feet apart and are kept pruned to a height convenient for harvesting. There are three harvests a year, in March, June, and November. The average yield of about 4 ounces per plant amounts to about 1,500 pounds per acre or 450 pounds per *cato*, to use the local unit of area. This yield collected three times a year amounts to over a thousand pounds of fresh leaves per *cato*, or about 500 pounds of dried leaves.

Method of Harvesting

The picking is done chiefly by women and children, who strip the leaves from the branches into an apron or poncho, from which they are emptied into a sack and carried to the drying shed. Here they are spread in a layer 2 or 3 inches deep, which is swept under cover at the slightest indication of rain. In good weather the drying may be completed in 6 or 8 hours. After drying, the leaves are thrown in a heap and undergo a sweating process for about 3 days. After this they are dried in the sun for about half an hour, and are then ready for shipment. They are packed in sacks or bales of different sizes, which are carried from the plantations to market or to the coast on the backs of carriers or by trains of mules or llamas. Mules can carry up to 300 pounds of the packaged leaves, but llamas refuse to carry so great a burden.

Varieties of Leaves

Two principal varieties of leaves reach the outside market—the large leaf called Huánuco or Bolivian coca, which is richer in cocaine, and the small leaf called Truxillo or Peruvian coca. Leaves are selected for chewing purposes by their odor and their sweetness or bitterness. The more bitter leaves contain a greater amount of cocaine. When a bale is opened, the odor is somewhat suggestive of that of Chinese tea or the vanilla bean.

There has been much discussion regarding the effects of confirmed coca chewing. The outward results are evident enough—the more or less disgusting traces about the mouth and the puffy or enlarged cheek—both quite similar to the signs that mark the confirmed chewer of tobacco. The physiological effects are still incompletely known. It must be emphasized that to identify the physiological and moral effects of the chewing of coca leaves on the human organism with those known to follow the continued use of cocaine is as unjustifiable as it would be to confuse, for instance, the results of steady or even excessive chewing or smoking of tobacco with the ingestion of large quantities of nicotine.

Effects of Chewing Leaves

The testimony of those who have had most direct experience with coca chewers is that coca is an effective stimulant in the conditions under which it is normally used. It removes for a day or even for several days the pangs of hunger and at the same times frees energy for prolonged physical exertion, presumably by making foods already stored in the body available for conversion into man-pounds; but it does this in such a way that the appetite for food is not permanently impaired and no lasting injury to the organism follows. Given the conditions of environment and food supply under which the Andean native lives, coca appears to merit its title of "the divine plant of the Incas."

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ALONG THE *Agricultural Front*

▲Mexican Visitors Study Agricultural Education

Dr. Felipe Gama Beltrán, Director of the National Breeding Station at Oaxaca, has been studying with the Bureau of Animal Industry and the Bureau of Dairy Industry of the Agricultural Research Administration. While in this country he has also visited various agricultural stations where experiments in his fields of interest are being carried on. Those interests are in breeding, in medical attention to stock at the station and throughout the villages, and in cooperation with the rural agricultural schools for the purpose of giving the students practical experience in the scientific care of animals.

Dr. Gama, a graduate in veterinary medicine from the Mexican National University, is the capable administrator of the experimental station of which he has been in charge since 1938. He has been particularly successful in promoting the breeding of good stock and the elimination of inferior strains. At present the efforts of the station are confined to the development of satisfactory strains of cattle, pigs, goats, and sheep; experiments with poultry are shortly to be instituted.

Ingeniero Mariano Quiroz Rubín is Director of the School of Agriculture at La Huerta, Michoacán, where he has done outstanding work in rural education. In the United States Señor Quiroz has been especially interested in observing work in agricultural education, research, and extension.

For the last five years, Augusto Pérez Toro has been Director of the Instituto Técnico Agrícola Henequenero at Mérida, Yucatán. This experimental station plays an important part in the economy of the State. It has been the scene of serious and comparatively large-scale experimentation with various forms of henequen and other fibrous plants, experimentation with grains suited to Yucatán, and laboratory experiments in the extraction of essential oils from plants native to the region.

Señor Pérez Toro has been making observations in such American universities, experiment stations and laboratories as are conducting experiments in fibrous plants, grains suited to warm climates, and the extraction of essential oils.

▲Cabuya Fiber Industry Developed in Ecuador

Assisted by United States technicians, Ecuador has begun development of a promising fiber industry to help meet the dislocations of war and become a part of the country's economy for all time.

With the loss of the Philippine Islands, one of the chief sources of fiber, the Western Hemisphere found itself short of rope and other fiber products. Ecuador itself no longer had enough sacks to ship its cocoa and coffee.

Fiber processing has not been unknown in Ecuador, but until now it has been conducted on a very small scale by the mountain Indians around Quito. One method of extracting the fiber was to place leaves of fibrous plants in roadways to be crushed by passing automobiles. The development of the cabuya fiber industry will provide an occupation in which a large part of the population can participate. With the aid of United States agriculturists detailed to the Ecuadoran Development Corporation, a "cabuya school" has been established. The agriculturists acquired a 10-acre plot for a demonstrational planting of seedlings. Next, five decorticating machines were obtained. Work also began on construction of spinning machines and looms. Lessons were given in processing.

Cabuya will do more than put money into the pockets of a few industrialists. Capable of becoming a real "cottage industry," it starts by providing a cash crop to farmers, big and little, who can grow it with little difficulty or outlay. By acquiring a decorticating machine in his own home, or in cooperation with other small growers, the farmer and his family can further increase their income by processing cabuya. The financial outlay is small; the technique can be acquired in half an hour.

Cabuya promises to become a nation-wide industry and to bring new money into the pockets of a substantial number of Ecuadoran citizens. And it will grow just as well in the mountains as on the coast.

▲ Notes on Latin American Studies

A new review, entitled "Notes on Latin American Studies" is being published under the direction of the Joint Committee on Latin American Studies, with Dr. Ralph L. Beals as editor.

The purpose of the review is to make known research projects proposed or under way or needed in the field of Latin American studies and to provide a medium for exchange of views and information. The review is planned as a semiannual publication.

▲Castor Seeds For War Industry

Castor oil is valuable as a lubricant for airplanes operating at high altitudes, as a hydraulic fluid used in retractable landing gear, and as a

drying oil for varnishes and paints. Mexico can grow the seeds from which the oil is made, and an arrangement by the Commodity Credit Corporation to purchase 225,000 long tons of the seeds during the 2-year period beginning April 30 is expected to stimulate Mexican production.

▲ Soil Conservation Progresses in Puerto Rico

Dr. Hugo W. Alberts returned in March from his work as Agronomist in Charge of the Soil Conservation Service in the Research Station at Río Piedras, Puerto Rico. Before leaving for his new assignment as Agricultural Advisor to the Ambassador at Lima, Peru, Mr. Alberts reported on Puerto Rican progress in soil conservation work.

The main conservation objectives of the Río Piedras station were to secure types of vegetation that could be utilized on terrace banks, on terrace outlet channels and in ditches to control erosion, as well as to determine the value of vegetation check dams and certain types of culture practices for control of erosion. A forthcoming publication on pastures in Puerto Rico, based partly upon the observations at this station, will soon be issued.

The soil conservation program in Puerto Rico and the Virgin Islands was organized by Mr. G. L. Crawford in 1936. Since that time, methods of procedure, applicable in tropical America, have been developed both at Río Piedras and Mayagüez. These include a cheap and practical way for making terraces by the use of grasses planted in rows nearly on the contour and the employment of certain crop successions that aid in conserving soil.

AUTHORS in This Issue

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Colombia

(*Concluded from page 120*)

Colombia's climate and soil are suitable for expanded production of several tropical and semitropical products that would complement the agricultural economy of the United States. Such products include Manila hemp or abacá, pita fiber, copra, sesame, palm oils, and rubber.

More than 9 million cattle are scattered over all 14 Departments, with heavier concentration in the Department of Bolívar in the north and in the highland areas of Antioquia, Caldas, and Cundinamarca. Cattle make up a good part of the wealth of Colombia. They furnish meat to supplement the diet of the people, and cattle hides rank high among the country's exports.

The most important of those exports are coffee, petroleum, gold, bananas, and hides. Imports are chiefly of manufactured goods, among which textiles hold the lead.

Forests

Dense forests cover from 50 to 60 percent of the total area of Colombia (from 150 to 175 million acres), particularly in the eastern selvas and in the Pacific-coast regions. They are of four types: Mangrove swamps on the Caribbean coast; dry, thorn forests on the Goajira Peninsula; tropical jungles on the coasts and along the rivers up to an elevation of 5,000 feet; and oak, pine, walnut, and willow forests higher on the mountains.

There has been almost no systematic exploitation of the forest resources. Very little has been taken from the eastern forests except small quantities of wild rubber. In addition to rubber trees, Colombia's forests contain large numbers of tagua palms (vegetable ivory trees), ceibas (silk-cotton trees that furnish kapok), copaiba, balsams and dyewoods, as well as cinchona, rotenone-bearing roots, tanning agents such as divi-divi, carnaúba wax, jipijapa (that furnishes toquilla fiber for the manufacture of Panama hats), and rare and beautiful orchids.

AGRICULTURE IN THE AMERICAS MADALINE W. NICHOLS, EDITOR

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LATIN AMERICAN GIFTS

CHEWING GUM

by LOIS OLSON

Chewing gum has become respectable; Uncle Sam has given it his stamp of approval. A stick of gum is now one of the "essentials" packed in the "K" or combat rations of our fighting men all over the world. For a long time manufacturers, and more recently scientists, have claimed that gum chewing increases the flow of saliva, relieves thirst, reduces muscular tension, and improves the disposition of anyone working under nervous strain. That, they said, is why more people than ever before chewed gum during the depression of the 1930's. The Army has accepted this verdict. Leading gum manufacturers now give the Army first option on their reduced production and war workers second. The ordinary civilian gum chewer comes last. He probably will be unable to get his average of 130 sticks of gum annually. The chicle that gives gum its soft chewy consistency comes chiefly from southeastern Mexico and Central America, and transportation is limited.

During the rainy season, hundreds of chicleros or chicle gatherers set forth into the tropical forests to collect the latex of the sapote tree, the *Achras zapota* of the botanists. Each year they penetrate farther into the dense forests in search of new trees to tap in place of those that have been exhausted and to provide greater supplies of raw material to meet the needs of an ever increasing market. In 1941 the United States imported about 20 million pounds of crude chicle.

Few gum chewers, however, realize that they have helped to foster a rapid advance in archaeological research in America. The sapote grows on the limestone lands of Yucatán and Central America, lands particularly suitable for Maya settlements. Since the fall of the Maya empire dense forests have grown up around the ruined towns and concealed their location. Exploration is not easy in these forests, but it would have been far more difficult had it not been for the chiclero trails. These paths became routes for archaeological explorers, and the chicleros became their guides and provisioners. Many of the most important finds were first pointed out by chicle gatherers.

Though Indian and Mexican had long chewed chicle gum, the development of the chicle industry and, following it, the archaeological research on the Maya culture of Yucatán and Central America, date back to the middle of the last century. Santa Ana, a Mexican General, was an exile on Long Island. His ingenious secretary first thought that the chewy latex of the sapote tree, brought from Mexico, might be used for rubber. Failing in this enterprise, he turned to the manufacture of chewing gum, and became the founder of an industry whose products are chewed the world over.

Colombia

Land

Colombia is a large country—almost 440,000 square miles—equal in size to the Atlantic Coast States from Maine to Florida, plus West Virginia and Ohio. Three great arms of the Andean mountain system reach across western Colombia from south to north. Between the eastern and central cordilleras, the largest and most important river, the Magdalena, flows north to the Caribbean Sea. Almost two-thirds of the country lies east of the mountains, covered in the south by dense tropical jungles and in the north by natural grasslands. Forest and woodland account for from 50 to 60 percent of the total area of the country and grazing land for another 23 percent. Only about 2 percent is cultivated.

Colombia is 1,110 miles long and 800 miles wide at its widest point. It is divided into 14 Departments or States and 10 Intendencias and Comisarías, or Territories.

Climate

Although all of Colombia is in the Tropics, temperature is controlled by elevation above the sea and varies little from season to season. Seasonal climatic variations are caused principally by variations in rainfall. The coastal plains and the eastern plains and tropical forests are hot, but the temperature falls as one travels higher and higher up the mountains through the perpetual Spring of Antioquia to the piercing cold of the high plateaus.

Population

About 70 percent of Colombia's nine million population is rural. From 10 to 15 percent is Indian; 10 percent of European descent; 30 to 35 percent Negro, mulatto, or that mixture of Indian and Negro known as zambo; and 30 to 50 percent mestizo. The population is concentrated in the "Highland Heart"; more than half the people live in the five States of Antioquia, Cundinamarca, Bolívar, Boyacá, and Caldas.

Agriculture

Colombia is primarily an agricultural country, and it is to agriculture that its people must continue to look for their livelihood. The 14 Departments constitute the present producing zone; the Territories have as yet only a small population and little economic importance.

Coffee is by far the leading commodity of Colombia. The value of coffee exports alone is more than three times the value of the production of corn, the next most valuable agricultural product. Colombia has second place in supplying world coffee exports and first place in supplying "mild" coffee. Before the war, bananas from the Santa Marta producing area were the other important agricultural export, but now production has fallen as a result of lack of shipping space to foreign markets and the inroads of the sigatoka disease. Corn is the staple food product, and its production is distributed widely in all Departments. Sugarcane, beans, wheat, potatoes, rice, and cacao are also grown for home use. Cotton and fique fiber production is increasing.

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Agriculture in the Americas

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IN THIS ISSUE

July 1943

NAMES & NEWS

Nineteen Latin American nations were represented at the United Nations Conference on Food and Agriculture, the first global gathering of government officials since the 1939 session of the League of Nations.

Chairman of the Bolivian delegation was Miguel Etchenique, United States Representative of the Banco Minero de Bolivia, and Member of the Agriculture and Irrigation Development Committee of the Ministry of Agriculture.

Delegates from Brazil included João Carlos Muniz, Ambassador to Ecuador; Jorge Kafouri, Head, Price Control Division, Office of Brazilian Economic Mobilization; Alfeu Domingues da Silva and Paulo Fróes da Cruz, Agricultural Attachés, Brazilian Embassy, Washington; and Newton de Castro Belleza, Assistant to the Minister of Agriculture.

Among the first to reach Washington was Señor J. Manuel Casanueva of Chile, Director General of Agricultural Services of the Ministry of Agriculture.

César García Alvarez, Minister Plenipotentiary and Economic Counselor, Colombian Embassy, Washington, was Chairman of the Colombian delegation, and Costa Rica was represented by J. Rafael Oreamuno.

Cuba sent Amadeo López Castro, Secretary of the Presidency, to lead its delegation.

J. M. Troncoso, Ambassador to the United States, headed a delegation of seven members from the Dominican Republic.

Ecuador was represented by Señor Alfredo Peñaherrera Vergara, Subsecretary of the Ministry of Agriculture, Industries, and Mines; Señor Gustavo Adolfo Fassio, nutrition expert; Arturo Meneses Pallares, Division of Labor, Pan American Union; and Pedro Leopoldo Núñez.

The neighboring Central American countries, El Salvador and Guatemala, appointed, respectively, Héctor David Castro, Ambassador to the United States, and Dr. Julio Gómez Robles, Under Secretary of Finance, to head their groups at the food parley.

From Haiti came Monsieur André Liautaud, Ambassador to the United States; Pierre Chauvet, Chief of the Service of Control of Industrial Development in the Department of Commerce and National Economy; and Edouard Baker, Agronomist of the Department of Agriculture.

Honduras was represented by Marcos Carías Reyes, Private Secretary to the President; Gregorio Reyes Zelaya, Collector of Customs; and Col. José Augusto Padilla Vega, Military Attaché, Honduran Embassy, Washington.

A large delegation came from our across-the-border neighbor, Mexico. It was headed by Manuel J. Zevada, Under Secretary of National Economy, and included representatives of agriculture, trade, and public health.

Another Ambassador who represented his country at the United Nations Food Conference was León DeBayle of Nicaragua.

An agrarian banker, the director of an agricultural laboratory, and the editor of a farm journal were delegated from Panama, Paraguay, and Peru. In the occupation and country named, these delegates were Ramón Antonio Vega, París E. Menéndez, and Gerardo Klinge. In addition to editing La Vida Agrícola, Señor Klinge is also Director of the Banco Agrícola and an agricultural engineer.

Uruguay sent Dr. Roberto E. MacEachen, Minister to Cuba, to head its delegation, and Venezuela responded to the invitation to help free the post-war world from want of food with three delegates and two advisers, led by José Joaquín González Gorrondona, President of the Import Control Commission.

Agriculture IN THE *Americas*

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Soil Conservation in South America

Soil erosion has taken toll of the agricultural resources of nearly all South American countries. A continental movement toward reducing the ravages of wind and water is now getting under way.

by ERNEST E. MAES

Thoughtful leaders of agriculture in nearly every South American country have long been aware of the serious economic and social problems that followed hard upon the heels of accelerated soil erosion. Although considerable thought had been given to the national implications of the problem, no attempt had been made to view it in its continental dimensions until the Eighth Scientific Congress met at Washington in June 1940. At that Congress one of the sections devoted itself almost exclusively to discussing the erosion problem and projecting a conservation program and movement that would embrace the entire South American Continent.

For the first time representatives of several American nations compared notes on the problem of conservation. Many of them had never given any thought to the erosion problem in their own countries, but as the nature of the problem was presented at the conference, it became apparent to them that erosion was a strong factor in many of their social and economic problems. Men like Dr. Roberto Alamo Ybarra of Venezuela, Dr. Jorge Ancizar Sordo of Colombia, Sr. Manuel Elgueta Guerin of Chile, Sr. Daniel Rey Vercessi of Uruguay, and Dr. Ernesto Molestina of Ecuador, all indicated that their countries had a serious problem of rapidly accelerating erosion, which was threatening the livelihood of hundreds of thousands of their citizens. The resulting clarification of the nature of the conservation problem turned these men into intense prophets who, when they returned to their respective countries, lost no opportunity to warn their fellow countrymen of the dangers inherent in unchecked erosion.

Before leaving the United States they set up an inter-American organization, which they hoped would be a vital factor in attacking the problem of conservation. This organization is the Pan American Soil Conservation Commission. It has great potentialities as the spearhead of the inter-American conservation movement.

The nature of this movement in South America might be indicated by describing briefly some of the conservation problems and by indicating some of the activities relating to conservation in each of the South American countries. Only limited information is available, and no definitive statement on the erosional status of the countries is possible until some basic data have been collected. To date, specific information on a nation-wide basis is meager for all the countries except Venezuela. During the last two and a half years, however, several of the countries have begun to appraise their erosion problem and, in some cases, to think in terms of remedial measures. On the basis of this limited material, a preliminary statement on the situation can be made.

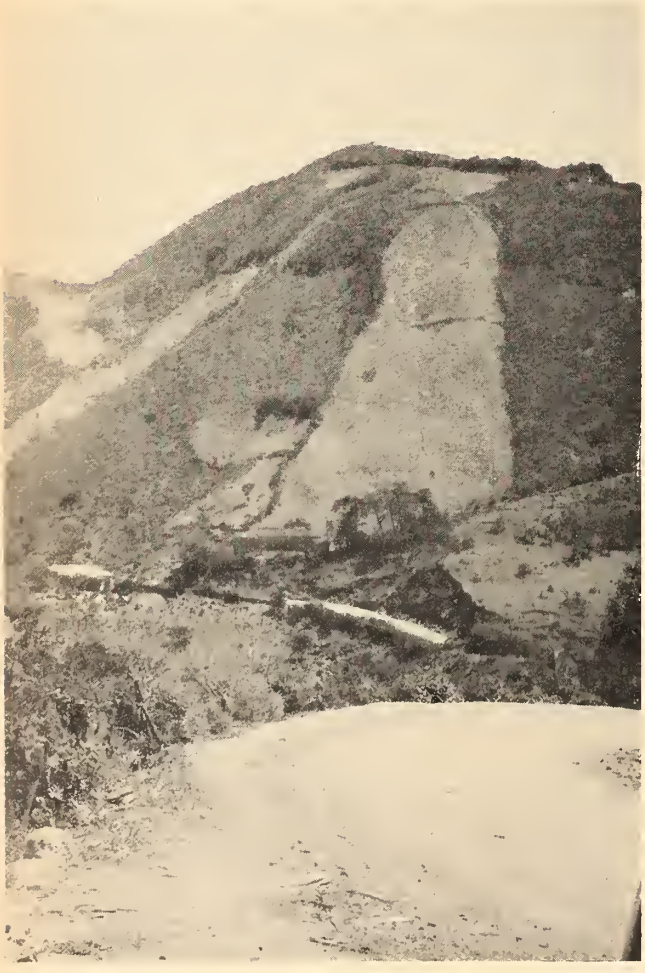
Venezuela Leads the Way.

As has been stated, the conservation problem of Venezuela is better known than that of any other Latin American country. This is because Dr. Roberto Alamo Ybarra, on his return to Venezuela after the Eighth Scientific Congress, was able to impress his Government with the seriousness of the erosion problem in that country. He pointed out that it would not be possible to evaluate the situation, however, until a study of the country's soil erosion had been made. This resulted in a request by the Venezuelan Government to the United States Soil Conservation Service for some technical assistance in determining the extent and nature of the erosion problem in that country.

In answer to this request a technical mission, headed by Dr. Hugh H. Bennett, Chief of Soil Conservation Service, went to Venezuela and, with the assistance of Venezuelan technicians, surveyed the situation. The results of this survey, not yet made public, will present the most complete picture yet obtained of the erosional

status of a Latin American country. From this beginning Venezuela is expected to initiate a long-term program of conservation. Already that country has shown its interest in the problem by setting up several demonstration projects where conservation practices are being carried out. At the present time two representatives of the Venezuelan Ministry of Agriculture are in the United States studying conservation under the in-service training program for Latin Americans of the Soil Conservation Service.

The erosion problem as usually recognized in Colombia is centered in the coffee-growing region. Erosion is even more serious, however, in the highland regions, which now have a dense population with large numbers of Indian communities. In these highland regions many of the small farmers are forced to use excessively steep slopes for their subsistence crops. The result is that tremendous areas of formerly fertile land are now destroyed, and other areas that once produced large quantities of potatoes, wheat, and other grains are now producing barely enough to return the seed to the farmers.



Hillside cornfield in Andean region of Venezuela, where erosion is rapid and the farmer has to move on after 2 or 3 years.

Certain other regions of Colombia, notably the Cauca Valley, have been opened up to extensive agriculture in comparatively recent times. In the absence of conservative land-use practices in these newly opened areas destruction by erosion has been increasing. The farmers in the vicinity of Medellín have seen a tremendous decline in the productive capacity of their lands and in recent years have become gravely concerned over the problem.

The Colombian delegate to the Eighth Scientific Congress, Dr. Jorge Ancizar Sordo, was able upon his return to interest a great many powerful persons and groups in his country in the general problem of conservation. Largely as a result of his efforts, the Colombian Government has organized a Soil Conservation Service which will function in its Ministry of National Economy. Among the groups that have become concerned over the erosion problem in Colombia is the National Society of Farmers, the most potent organization of landowners in the country.

Ecuador's Highlands Most Affected.

Ecuador is almost completely dependent upon agriculture. As in most of the Latin American countries, the overwhelming majority of the farming population produce only subsistence crops. On the other hand, the farmers who produce the export products—sugar, rice, and cocoa—form the dominant group in the country. It so happens that the commercial agriculture is almost all concentrated along the coastal plain, and in that area the erosion problem is practically nonexistent. The subsistence agriculture, on the other hand, is carried on for the most part by the Indian farmers of the highland region; and it is there, on the steep lands cultivated by these farmers, that the serious erosion problem of the country is located.

In those areas of Ecuador, notably the region of the Otavalo communities in the north, where Indians have farmed their lands for many centuries, they have learned to protect the soil by the use of crude terraces. These are usually formed by planting the agave plant along the fence borders. In time a certain amount of soil is deposited behind these plants, with the result that almost all the cultivable land is at least somewhat protected. On the other hand, in certain parts of Ecuador large estates are being subdivided for sale to the Indian farmers, and the problem of erosion is most serious on the land that has only recently been thus acquired by the Indians. In these areas the Indians, because they lack any but the crudest tools, usually farm their lands without regard to conservation. Consequently, in a few

Eucalyptus trees serve as windbreaks near Ambato Ecuador.

years much of the topsoil has been washed away, and the lands gained by the Indians at a tremendous cost of labor lose much of their productivity.

Until recently the Ministry of Agriculture of that country, with its great preoccupation with the problems of commercial agriculture, had not given any consideration to soil erosion in the highland area. However, one of the Ecuadoran delegates to the Eighth Scientific Congress, Dr. Ernesto Molestina, Director General of Agriculture, became tremendously interested in the work of the conservation section. He realized that the matter under discussion was applicable to Ecuador and that erosion was a real and serious threat to his country's agricultural economy. Since his return to Quito he has been actively engaged in interesting his Ministry in developing a nation-wide program of conservation.

Because of his country's lack of resources, and especially because the people most affected by the erosion problem are not in a position to demand governmental assistance, Dr. Molestina feels that it will not be possible, without outside assistance, for his country to develop an adequate conservation program. He does believe that it will be possible for Ecuador to develop a small-scale demonstration program of conservation practices in a few strategically located government-owned tracts of land in the highlands. In addition, he wants the Ministry to extend its eucalyptus-tree program, which is of increasing importance. He realizes, however, that the poverty of the small landholders in the highlands is so great that it will be almost impossible for them to initiate conservative land-use practices because of a shortage of even the simplest tools.

Peru's Problem Varied.

The problem in Peru, as in Ecuador, is concentrated in the highland regions where the Indian small-scale farmers are concentrated. The extent of soil erosion, however, varies widely. In certain areas, as for example the Cuzco Valley and other valleys in the vicinity of the city of Cuzco, there developed in ancient times what is possibly the most adequate conservation farming in the world. Innumerable terraces that have been in constant use since time immemorial, still exist, and the conservative use of farming land might be said to be almost an instinct with the Indians of that region. Erosion, on the other hand, constitutes a serious menace to the livelihood of the people in other portions of the highlands, especially in the heavily populated Departments of Huánuco and Junín. In these rather extensive areas, as in Ecuador, the problem is accentuated by the poverty of the small Indian farmers and by the lack of conservation techniques. The Indians of these regions have made infinite sacrifices to get and to hold on to their lands, and yet they are losing them constantly to the ravages of erosion.

The Ministry of Agriculture in Peru also has been concerned for the most part with the problems of the commercial agriculture of the coastal valleys, which provide Peru's exports, and where erosion is hardly a problem. No serious thought has been given to the erosion problem of the highlands; the only effort that might be considered to be directed toward conservation is an attempt to induce certain mountain landholders to plant eucalyptus on some of the more seriously eroded lands. In short, to date only a few people in the Ministry of Development, which has charge of agriculture, have become interested in the problem of conservation. As the educational program of the Peruvian Government develops in the mountain areas conservation may possibly become an integral part of the new Indian educational curriculum. There is evidence that the Ministry of Education rather than the Ministry of Agriculture may take the lead in a conservation program for that country.

Soil erosion in Bolivia is believed to be centered in its Andean regions. As in Peru and Ecuador, the eroded areas are for the most part used by the small Indian farmers who raise potatoes and a few other crops for their own subsistence. The Bolivian Government has

Ancient Indian terraces in Peru.

Wheat stacked in La Pampa, the dust bowl of Argentina.

only recently begun to give adequate consideration to the erosion problem of these Indian holdings, perhaps because the national economy of that country is tied to mining, and relatively little attention has been given to agricultural questions. The Ministry of Agriculture has been interested for some time in the problems of those areas where commercial agriculture is being developed and is now giving added attention to the conservation and development problems of the subsistence areas.

As in the case of Peru, the possibilities of a conservation program for Bolivia probably will depend on the interest that the Ministry of Education takes in the problem. As the educational program of the country develops, conservation might possibly become an integral part of the rural educational curriculum. The officials of the Ministry of Education are definitely interested in this possibility.

The yield of wheat has been reduced by from one-half to three-fourths by the action of erosion over extensive areas of southern Chile. Many of these, especially in the region around Temuco, have been given over to wheat production for many years. Although virtually all the wheat lands are characterized by a rolling topography, no significant attempt has ever been made to strip-crop or counterfurrow them. Inasmuch as the entire region is one of high rainfall, averaging some 50 inches annually, past farming practices have resulted in the rapid loss of topsoil and, of course, fertility. Because of this, almost everybody concerned with agriculture in that country is actively interested in the possibilities of developing a nation-wide conservation program.

Much thought had been given to this problem long before the Eighth Scientific Congress. One of the Chilean delegates to that Congress, Dr. Manuel Elgueta Guerin, thought that the conference discussion of conservation was of vital significance to his country. Since his return to Chile he has carried on an intensive campaign to make the farmers and the farm organizations, as well as the Ministry of Agriculture, conscious of the serious erosion menace. As a result of this work, the Ministry of Agriculture has projected an extensive program of surveys and plant experimentation, out of which a program of conservation demonstration is expected to develop. A central feature of the projected demonstration program will be an effort to get large areas of land, formerly given over to wheat, into pasture. The Chilean Government has requested technical assistance from the Soil Conservation Service in initiating its program, and undoubtedly Chile will become one of the leaders in the inter-American conservation movement.

Argentina is the only country in South America that suffers from wind erosion in addition to water erosion. The problem of wind erosion is similar to that of the so-called dust-bowl area of the United States and was brought about by plowing up grassland unsuited for dry cultivation. During the last few years there has been a progressive increase in the seriousness of the wind erosion that follows on the heels of a dry cycle. In 1937 duststorms in the whole pampa region were the most devastating ever known there. Extensive areas were denuded of topsoil, and roads and fences in many parts were almost covered by the accumulated dust. Certain areas in Argentina having a rolling topography are seriously eroded also by water. This is especially true in the Territory of Misiones and in certain areas of the Province of Santa Fé. This problem is the result of the improper farm practice of breaking up for cultivation lands that are too steep.

Argentina Initiates a Program.

For some years the Argentine Ministry of Agriculture has been aware of the seriousness of the erosion problem. In 1937, after the duststorms in La Pampa, several investigations of the wind-erosion problem were made. With an increase in precipitation during the years since 1937, there has been a tendency to forget about that problem. The people aware of the situation have been able, however, to get across the notion that there is not much logic in producing tremendous quantities of unexportable wheat in areas that should properly be given over to pasture. Among those people are certain members of the staff of the Ministry of Agriculture who have been using this argument in persuading the Ministry to take steps toward setting up a conservation program. The leader of this movement in the Ministry is Dr. Antonio Arena, the Chief of the Division of Soils, and recently a visitor to the United States, where he made an extensive study of soil-conservation work in this country. The Argentine Ministry of Agriculture is expected shortly to set up a Soil Conservation Service, possibly headed by Dr. Arena, which will initiate a nation-wide program of surveys, conservation education, and demonstration projects in the eroded areas.

The erosional problem in Uruguay is similar to the water-erosion problem in Argentina. Inasmuch as Uruguay is largely a stock-raising country, many of the people there recognize that overgrazing has been an important factor in creating the problem. The topography of the entire country is susceptible to erosion, and its effects are becoming increasingly evident in the reduced amount of feed being produced by the pasture lands. Uruguay is the only South American country with a serious problem of advancing beach sands along its eastern coast line; and a considerable amount of work, consisting for the most part of extensive pine-tree plantings, has been carried out to combat it.

The Uruguayan delegate to the Eighth Scientific Congress, Dr. Daniel Rey Vercessi, was much impressed by the discussion of conservation and, upon his return to Uruguay, convinced several officials in the Ministry of Agriculture of the seriousness of the situation there. As a result of his efforts, a commission was named to investigate the problem, and it produced a preliminary survey of existing conditions. Out of this developed a project for the creation of a conservation service in Uruguay to be advisory to several ministries of the Government. A great many of the Uruguayan agricultural leaders now recognize the seriousness of their erosion problem, and undoubtedly Uruguay, progressive country that it is, will take an active part in a conservation movement.

The agriculture of Brazil is for the most part centered in the State of São Paulo. This State, with a rolling topography throughout, is susceptible to water erosion, which is perhaps more serious there than elsewhere in the country. The problem of moisture conservation in the northeastern States is, however, also serious, and in other areas cut-over forest lands are already becoming extensive enough to offer a real problem in conservation. Nevertheless, São Paulo is the only State in Brazil with a widespread consciousness of the need for soil conservation, and it has initiated a rather broad program of conservation under the leadership of the Estacion Experimental do Campinas. As a result of its work, extensive areas are today farmed on the contour, and the realization on the part of the São Paulo farmers of the need for conservation is increasing.

The difficulty of awakening a consciousness of the need for a nation-wide conservation program in Brazil might be due to the immensity of Brazilian land resources. Even in the vast Amazon country, however, the problem of cut-over lands is already serious. The farmers burn out the jungle and plant crops on the cleared land for 1 or at most 2 years and then abandon it. The result is that areas not yet cut over are becoming relatively limited.

This problem, of course, is related to the general problem of conservation, but up to the present Brazil has shown a tendency to look upon soil conservation only in its relation to water erosion. Fortunately, certain officials in the Ministry of Agriculture are conscious of the true nature of the problem and are giving it some thought. Dr. Heitor Grillo, the Director General of the National Center for the Teaching of Agricultural Sciences, is one of these. Dr. Grillo is the Brazilian representative on the Pan American Soil Conservation Commission. In the near future the Brazilian Government possibly may initiate an extensive program of moisture conservation in the northeastern States that suffer from drought.

Spectacular erosion in Chile.

The foregoing, in brief, is an outline of the conservation problem in the South American countries (except Paraguay, where no pronounced consciousness of an erosion problem yet appears). In addition, it is an attempt to indicate what certain people who have given the conservation problem some thought are doing to develop national programs of conservation. Since the meeting of the Eighth Scientific Congress there has developed for the first time a consciousness in each of the South American countries that conservation is actually a continental problem. They are aware of the valuable lessons that they can obtain from the experience of the United States in its soil-conservation program, and without exception, they are anxious to receive all the benefits possible. Conservation is undoubtedly going to be one of the most vital fields for inter-American collaboration in the future.

The basis of this collaboration has been laid by the formation of the Pan American Soil Conservation Commission. The first meeting of the organization was held at the Pan American Union in Washington on September 3, 1942. At this meeting the delegates of the member countries elected Dr. Bennett chairman of the Commission and empowered him to formulate, with the assistance of a small executive committee, a program of action. This is expected to be an important segment of the total program of inter-American cooperation.

Nicaragua—Lake Country of Central America

Nicaragua, the largest Central American republic, has a history closely linked with that of the United States. Today it stands firm in espousing the cause of inter-American understanding.

by PHILIP LEONARD GREEN

Nicaragua derives its name from that of the Indian chieftain who ruled at the time the Spanish *conquistadores* arrived. Like other countries of Central America, especially those to the north, its interesting history dates back to pre-Hispanic times. Many ruins of early American civilizations may be found.

Columbus sailed along the Atlantic seaboard of what is today Nicaragua, as early as 1502; but actual settlements were first made by Spaniards from Panama in 1519. Granada, the city named after the famous center of Moorish culture in Spain, was founded in 1524. The Spaniards found the region around the southwestern shore of Lake Nicaragua fairly well populated. The Indians were living on corn, game, and fish. They were inclined to be peaceful In fact, they presented the Spaniards with considerable gold.

In colonial times, Nicaragua formed part of Spain's Central American colony, with the capital at Guatemala City. Soon after gaining freedom from the mother country, Nicaragua joined the Federation of Central America. This lasted only 16 years, after which Nicaragua went its own way.

This country, with an area of 50,000 square miles, is about as large as New York State and leads all the Central American countries in size. Guatemala actually has more land, but Nicaragua's total area comprises two large lakes. The smaller of these, Lake Managua, is 40 miles long and 136 feet above sea level. The larger, Lake Nicaragua, is 115 miles long and 45 miles wide. The latter is only 110 feet above sea level, and it is planned to use it as part of a future interoceanic waterway.

Courtesy of the Pan American Union.

Lake Managua, on the southern shores of which is Nicaragua's capital city.

Nicaragua is divided into three general regions. First, is the eastern or Caribbean coastal area, generally known as the Mosquito coast. This is not because of mosquitoes. The name is derived from the Meskito Indians who were found there in the early days. It is a low, hot region, swept by moist Caribbean winds, with about 255 inches of rainfall a year. Here there are great possibilities for the cultivation of tropical products such as rubber and coconuts. This area

is characterized by its rivers, which, bordered by fertile sedimentary silt, provide means of transportation.

Then come the central highlands, which make up the largest part of the republic's land area. Along the line where the east winds are forced over the eastern slopes leading to this area, rainfall is heavy. Tropical forests abound in this belt and in the entire area eastward to the Caribbean.

Farther west are the lowlands, which extend southeastward. These include the hilly land between the lakes and the Pacific coast, where most of the important cities are located, and where by far the largest number of Nicaragua's 1,380,000 people live.

The lowlands are fertile and not mountainous. Lava, ash, and dust from the numerous volcanoes in the region have enriched the land enormously. The advantages of volcanic soils at a relatively low altitude are recognized by tropical agriculturists.

On the northeast side of Lake Nicaragua, however, only irrigation could make crops grow because of the relatively low rainfall and the high temperature, causing water to evaporate quickly. Yet no large amounts of water are to be had for irrigation, since most of the streams flow eastward on the wet side of the mountains. Pumping water from the lakes, however, offers real possibilities.

The highlands are sparsely populated. A few cattle ranchers are concentrated along the western edge. Forests of oak and pine can be seen in this region, which marks the southernmost stand of the North American pine.

Strangely enough for a land that is largely agricultural and pastoral, almost a fourth of Nicaragua's people live in cities. This is due largely to the former lack of protection in rural districts. The largest city is Managua, the capital, with 118,500 inhabitants. Then come León with 33,000 and Granada with 22,300, which cities have been the symbols of a historic political rivalry throughout most of Nicaragua's history. Around the latter were established, in the early days, large estates growing cacao, indigo, and sugarcane. Their prosperity was based on an abundant supply of Indian laborers. León, on the other hand, never had enough workers, and its people were too poor to import them. Managua, the capital, is equidistant between Granada and León. It represents something of an effort to settle a long-standing rivalry between these two proud cities.

During the California gold rush of 1849, many seekers after the precious metal made their way across the isthmus of Nicaragua, by using the services of Colonel Vanderbilt's famous "Accessory Transit Company," which operated small steamers on Lake Nicaragua, supplemented by coaches from the lake to San Juan del Sur. Thus, Nicaragua "saw them come and go," literally as well as figuratively.

Nicaragua's strategic position, athwart one of the natural transisthmian routes, has in fact, affected its entire history. Long before the Panama Canal was built, Nicaragua was spoken of as a favored location for an ocean-to-ocean waterway. The idea was first broached in the early 1500's, but it was not until 1916 that the Bryan-Chamorro Treaty with the United States was ratified. It gave the United States the sole right to build a canal across Nicaragua and to establish naval bases in the Corn Islands off the east coast and on the Gulf of Fonseca, near the western end of the proposed canal.

In any plan undertaken, Lake Nicaragua, the largest body of fresh water between the North American Great Lakes and Lake Titicaca in South America, would probably be used as one of the main portions of the proposed waterway. The lake drains into the Caribbean, via the San Juan River. Dredging this river would permit the entry of ocean-going vessels to the lake. To the west, the mountain range between the lake and the Pacific Ocean is low, and the distance between the two is only 17 miles. This is where a canal would have to be dug. Hydrographic observations have been made along the line of the proposed waterway, and hopes are high in Nicaragua that some day, in the not too distant future, the canal may be a reality. Any practical plans also would probably call for a road to run parallel to the canal. The sponsors of the proposal fervently hope that the canal will solve many of Nicaragua's financial problems and thus be to Nicaragua what the Panama Canal has been to Panama. Nicaragua has been a relatively poor country, and this has made it difficult at times for the Government to maintain even the services needed to guarantee public safety.

Yet, despite this fact, it is extremely interesting to note that Nicaragua recently arranged to pay off the country's frozen commercial debt more than 3 years prior to the date on which it was to become due. The debt contract was signed in 1938 and was to run for a period of 8 years.

Courtesy of the Pan American Union.

The President's mansion at Managua.

Though a canal would aid the economy of Nicaragua in a most effective manner, many of the country's leaders consider the development of agriculture and livestock raising equally important.

Nicaragua's main agricultural and forest products are coffee, bananas, cotton, dyewoods, cabinet woods, hides, and sugar. These are largely cash crops, grown for export. For home consumption, Nicaragua raises rice, beans, corn, some vegetables, and tropical fruits.

Coffee is grown north and south of Managua and on the plateau near Matagalpa. Cattle is raised on the southern plateau.

Travelers have told of seeing sugarcane growing on land that had never been plowed. All that was needed was to clear the ground and plant it. Sugarcane can be grown in Nicaragua for 15 consecutive years from the same roots, though the crop decreases after 8 years. It is usual to plant such land to corn and beans or to allow pasture to grow.

The Mortgage Bank of Nicaragua has aided agriculture considerably. It was incorporated in 1930 with a capitalization of 300,000 córdobas, which was raised in 1934 to 3,000,000 córdobas. (The córdoba is currently equal to about $0.20, United States currency.) It is the official banking institution of the republic.

The United States takes about 95 percent of Nicaragua's exports, whereas about 85 percent of Nicaragua's imports originate in the United States. Thus one can see that the two countries are interdependent economically.

The war has served to bring the republics even more closely together. Nicaragua was one of the Latin American countries that early ranged themselves on the side of the United Nations in the world struggle.

Under an agreement signed by the Nicaraguan Minister of Agriculture and the United States Secretary of Agriculture during the Second Inter-American Conference on Agriculture, the two countries have jointly established a cooperative agricultural experiment station at El Recreo. This is expected to become a focal point for the future development of Nicaragua's agricultural life which will benefit the country most effectively and contribute toward furthering practical inter-American cooperation.

Another of Nicaragua's contributions to this end is the forward-looking spirit of its leaders. From the early days of the colony, when the name of Miguel Larreinaga was held in high esteem in the scientific circles of Europe, Nicaraguans have distinguished themselves and their country in many fields of human endeavor.

Courtesy of Office of Inter-American Affairs.

A large ranch in Nicaragua with volcano in the background.

Quinine From Seed

Many problems confront the North American who undertakes to grow tropical plants. Cinchona seedlings are, however, being successfully produced in the United States for shipment to the South American tropics—the native lands of the "fever tree."

by B. Y. MORRISON

With the development of inter-American agricultural collaboration has come an increased interest in the growth of tropical plants, especially those of strategic importance. Such a plant is the cinchona, which is the source of quinine.

In the growth of any plant from seed there are certain basic considerations long known in garden practice and more and more completely understood of late in the terminology of the laboratory scientist. For the old rule-of-thumb gardener, the procedure was no more than to plant seed at what seemed to him the proper depth; give it such amounts of water, light, and air as he might conceive advisable; and await its germination. Afterward there would be the inevitable practices of transplanting—a system devised to maintain the small individual entities in active and rapid growth.

Since every phase vaguely touched upon in the preceding paragraph is open to considerable variation, the sum total of the variations becomes greater. The hazards might seem too tremendous to face.

One must recall, also, that many of our traditional practices, which have become concrete in written form, had their rise in north European countries before they came to us and that we now operate under this inherited code, modified by our own interpretation of the principles and practices set forth by our horticultural predecessors.

The North American who interests himself in growing quinine from seed comes to his task with the limitations of his own training and experience. To such limitations he adds his ignorance of the procedures and practices under tropical conditions—a lack which cannot be completely clarified by reading the reports of many workers, all of whom appear to dwell upon the extreme difficulties of the sowing and growing and have relatively little to say about the successes.

The planter, using his wit, can discover with some degree of certainty that all the quinines are woody plants ranging from much-branched small trees to forest trees of great stature; that they range in distribution at altitudes between 3,000 and 7,000 feet, in areas where there are no killing frosts as we understand them, though there may be at the higher altitudes a continuous low temperature throughout the tree's growth with no excessive lows or highs; that they are mostly denizens of mixed forests, with the implicit suggestion of broken light during juvenile stages and a forest floor rich in humus and probably acid; that their flowering is abundant (many flowers are borne in lilaclike panicles), wind-pollinated, and all seed capsules of the inflorescence do not mature at one time.

The planter will also discover many reports of "no germination" without further explanation, and he may discover the suggestion that the seed does not hold its viability long. In this last note he may find comfort for his own failures, for the seeds available to him are often of uncertain age.

The purpose of experiments at the United States Plant Introduction Garden at Glendale, Maryland, was essentially to produce as quickly as possible the greatest number of young plants to be sent to our sister republics for permanent planting. There was available some seed of uncertain age and some seed known to be of recent harvest, though whether of 2 weeks or 2 months there was no knowing.

Sowing cinchona seeds in sphagnum moss at the United States Plant Introduction Garden at Glendale, Maryland.

New transplants in foreground; 6-month seedlings in background.

For some years there had been in extensive use at the garden an old garden practice—namely, the sowing of fine seeds on a surface of sifted sphagnum moss. This moss had served excellently well as a medium for growing azaleas and rhododendron seedlings, plants equally appreciative of even moisture, acid reaction, and broken light. Other experiments had shown that definite inoculations of various organisms of the "damping off" type failed to grow much beyond the point of inoculation.

With these experiments accepted as a possible point of departure, highly successful sowings have been carried on ever since with minor modifications and clarifications that have been designed only to hasten our work and simplify our labors.

Briefly and categorically stated: Fresh cinchona seed may be expected to germinate abundantly *here* in a period between 11 and 20 days, if sown on a surface of sifted sphagnum, in a flat prepared as shown in illustrations, covered with a frame and glass to conserve moisture, kept in a house that preferably never varies in temperature below 70° F. (lower temperatures retard germination and higher temperatures are apparently fatal), with greatly reduced light but not complete darkness, and moisture that does not vary in the moss. The proofs to support these statements and the evidence which led to their formulation will be presented elsewhere and in many cases by others. Our chief purpose here is to affirm that under given conditions the growth of quinine from seed is no more difficult than that of any other plant such as radish, tomato, or marigolds, each of which can present troubles enough if one does not follow the routine.

There are certain points that can be set down rather arbitrarily here, not only for later defense but also for present use.

If cinchona seed is old and one has no knowledge of storage conditions before receipt, poor germination may be expected. If it is fresh and must be stored, it should be kept from excessive heat and dryness. If it cannot be stored, there is evidence that it can be sown safely in sphagnum and the crowded seed flats maintained without transplanting in perfect safety for at least 7 months. The chief modifications in practices have been a relatively cool temperature and reduced watering. Seedlings so treated have grown on perfectly when brought into normal conditions later, and it may well be recalled that one can find seedlings that represent these conditions in all factors save crowding in many of our forest floors.

Sphagnum moss presents a seed medium that appears to be nearly aseptic and provides a medium of root growth that does not create difficulties in drainage. Errors from overwatering do not arise, nor do difficulties occur if one resorts to liquid feeding. Plants are easily transplanted from the moss without injury to roots. It decays quickly when planted in soil with the young plants and provides a medium that does not suffer in transport even if plants are dropped in handling.

Light must be regulated. Errors should be on the side of less light during the early stages. Gradual admission of more and more light must come during the nursery transplant stages.

Air conditions must be studied. In seedbed and nursery stages there should be a minimum of air movement, but abundant humidity must be present. In later transplant beds and permanent locations, protection from violent air currents or prevailing winds should be considered.

Soil should be acid in reaction. Under our conditions, no damaging excess of acidity has been discovered. Lime as an element is definitely harmful. No special responses

Cinchona plants lifted for shipment.

have been shown to excesses of potash or phosphorus, but excesses of nitrogen lead to rapid growth which may produce difficulties in routine handling which any gardener will know how to compensate. Great amounts of humus seem highly desirable, since they usually provide the desired acidity and that perfect combination of moisture retention and good drainage that appears to be vital.

Handling routines do not differ much from usual practices. Young seedlings may be transplanted as soon as one can handle them, provided they are given the usual protection from excessive light and drying. Later transplantings are no more difficult. And, if one may believe reports, later transplantings to the field are less likely to loss than the earlier moves.

Budding and grafting procedures cannot be discussed at this time, but the two reasons for resorting to such procedures are (1) the vegetative propagation of individual trees of known value and (2) the production of Ledger plants on rootstocks that can be employed on previously cultivated land. Since it is probable that all first nurseries will have available virgin soil, the use of Ledger seedlings need not be frowned upon for the beginnings.

Choice of planting sites will be affected only by keeping in mind all the difficulties that appear as potent factors in the earliest stages of growth: good drainage, acid soil rich in humus, broken light, protection from gales and strong winds, reasonable attention for continued growth. The dangers that may easily arise are excesses of direct sunlight and extended droughts which appear to work toward premature senescence and early seeding (a condition which may be invited if one wants early seed supplies) and the appearance of diseases which are not yet known as specific for quinine in the areas to be brought under cultivation. It is more than reasonable to expect both such disease attack and probable later insect attack, though for the present the usual tropical difficulty with damping-off and with ants are the conspicuous hazards. Time and experience will undoubtedly bring others.

Reading
ABOUT THE AMERICAS

A New Pronouncing Dictionary of the Spanish and English Languages, Mariano Velázquez de la Cadena, comp.; 766 pp., Wilcox and Follett Co., Chicago–New York, 1942. For many years the "Velázquez Spanish Dictionary" has been a recognized authority in the Spanish-English, English-Spanish field. Rapidly expanding relations between the Americas and equally rapid expansion of technical vocabularies have demanded a new edition of this basic work. Now reedited by Edward Gray and Juan L. Iribas, and with a "Supplement of New Words" by Carlos Toral, the new Velázquez remains an essential tool for work in the Spanish American or Spanish fields.

The dictionary has been thoroughly revised, and over 8,000 new words have been added. While taken from every field of human endeavor, special emphasis has been placed on the scientific, technical, commercial, military, recreational, amusement, and athletic terms that have recently become part of the language.

The American Geographical Society's Map of the Americas. Index; 77 pp., American Geographical Society, New York, 1942. An index of the place names on the three sheets of the well-known "Five Millionth" map. This map was printed on three sheets covering, respectively, Mexico, Central America and the West Indies; South America, Sheet North; and South America, Sheet South.

Alphabetically arranged, the names are followed by indication of the country to which they belong; note of the particular sheet of the map on which they are to be found; and the location with reference to the 2° grid of latitude and longitude appearing on the map. Variations in print indicate whether the names refer to towns, major civil divisions, or names of physical features.

This index will undoubtedly be an indispensable tool for all serious students of the Latin American field.

Divry's Spanish-English and English-Spanish Dictionary, J. M. Douglas *and* Al. Lomo, eds.; 536 pp., D. C. Divry, Inc., New York, 1942. Over 60,000 words arranged in a compact pocket dictionary. The volume also contains synopses of English and Spanish grammar, a full list of Spanish and English irregular verbs, explanations of suffixes and prefixes and equivalents in English and Spanish, an extensive list of proper names, the principal cities of North, Central, and South America, with their latest populations, colored maps, tables of weights and measures, thermometer equivalents, and other useful information.

New Technical and Commercial Dictionary, Antonio Perol Guerrero, ed.; 600 pp., Editorial Técnica Unida, Brooklyn, N. Y., 1942. This dictionary is noted to contain more than 50,000 words used in engineering, radio, mining, textile and other industries, modern words referring to warfare, and words used in business and commerce. It contains many agricultural terms as well.

To Make Tough Meat Tender

Modern papain is scientifically prepared from the latex of the papaya plant, but even the original inhabitants of tropical America used papaya leaves to "tenderize" tough meat and the juices of the plant to alleviate indigestion.

by ROGERS McVAUGH

The present war has focused attention on a considerable group of strictly American plants that have been carried by man to the tropics of the Old World and there proved so successful in cultivation that they could no longer be exploited profitably at home. The most conspicuous examples are rubber and quinine, both so vitally necessary to our war effort and now unobtainable except from the previously neglected sources in the American tropics. In the same category, although far outranked in importance, is the useful papaya, so easy of propagation as to become almost a weed and now to be found in almost all tropical and subtropical regions. Originally a native of the West Indies or perhaps of Mexico—like so many of our edible fruits its origin is shrouded in uncertainty—it is now perfectly at home in both hemispheres. It reached India before 1600, perhaps by way of the Philippines, and it is now extensively cultivated in India and Ceylon and as far south as Sydney, Australia.

Properties Impress Early Travelers.

Early travelers in America were impressed by the papaya not only because of its large and delicious fruits and by the amazingly rapid growth of the plants, which often came to maturity and fruited less than a year after the planting of the seed, but also by the peculiarly powerful digestive properties inherent in all parts of the plant. These digestive properties were well known to the original inhabitants of tropical America, who wrapped tough meats in papaya leaves for short periods or even boiled particularly refractory cuts with the leaves—the original "tenderizing" process. Popular legend has it that old hogs and other animals fed on the leaves acquire tender flesh thereby, and even that tough meat hung in the papaya tree amid the softening influences of its leaves becomes more readily digestible.

The digestive properties of the papaya were found to be due to a substance, appropriately named papain, which is present in most parts of the plant and which is readily obtained, in more or less pure form, from the milky juice which is abundantly exuded when the fruit or some other part of the plant is cut. One of the first uses made of papain was in the preparation of medicines designed to cure or alleviate dyspepsia. About the turn of the last century, considerable quantities of the enzyme were imported, not from Latin America, but chiefly from India and Ceylon, where cheap and often intermittent labor was utilized in the production of equally cheap grades of papain.

As time went on new industrial uses were found for the enzyme. Its importance increased with the discovery of means of using it in the meat-packing industry, in the brewers' trade, and in the tanning of leather. Recently papain has been used for preventing shrinkage

A cluster of fruits ready for picking.

in wool. Although its use in pharmaceutical preparations has decreased in recent years, production has continued to increase; imports into the United States alone more than tripled between the period 1930–33 and 1939, the last year for which figures are generally available. Unfortunately for the continuation of the import trade, however, most of the papain in 1939 came to the United States from Ceylon, from British India or from Japan.

Happily for the continued production of papain, there are undoubtedly enough plants already growing in Latin America to supply all our domestic demands for the enzyme. The problem, however, is not so simple. As most of the papayas in the American tropics are not in formal groves or orchards, but are scattered here and there, one or two to a dooryard or casually along roads and trails, a considerable problem in the marketing of the raw product is involved. Only in Hawaii, perhaps, is there a sufficiently large papaya industry to cope with marketing problems, and even there, as indeed elsewhere where papayas are grown, the papaya as a source of papain has to compete with the papaya as a fruit. While recognizing that they can produce papain as a by-product, fruit growers have hesitated to make any large investments in it because of the relatively limited demand for the enzyme. Now that the war has cut off our supplies from Asia, it may be that the demand for papain will justify either increased cultivation of the papaya in areas where this is already an active industry or the development of cooperative marketing enterprises in parts of America where papayas grow naturally, more or less without cultivation.

Plants Quickly and Easily Grown.

In striking contrast to the plants which produce rubber and quinine, the papaya is a large herbaceous plant which attains treelike stature in a year or less after it begins growth. It is easily grown from seed—an observation verified by a glance at the numerous wild seedlings that spring up here and there in uncultivated areas from southern Florida southward—and, in theory at least, a plantation of any desired size may be brought to bearing age, ready for the production of papain, in a very few months. In actual practice this time will doubtless be extended, either by factors of soil or by climate, or perhaps by delays incident to clearing or preparing land, or securing a sufficient supply of seed. In most areas, however, there would seem to be no insurmountable obstacle to the rapid development of papaya cultivation if the demand warrant such an expansion.

In former years all the commercial papain has been obtained by tapping the slightly immature fruits and collecting the latex that flows from the cut surfaces. It has been estimated that the average annual yield per

An experimental grove of papayas in Florida.

plant, when tapping of this kind is done several times during the year, is about 100 grams (roughly 3 and one-half ounces) of the dried latex. In Ceylon it was formerly the practice for the natives to collect the sun-dried latex from widely scattered trees and then to bring their individual contributions to some central spot from which it could be shipped in bulk. When collected in this way and prepared by different individuals using different degrees of care and intelligence, the commercial papain was found to be far from uniform in quality, and often to contain adulterants or impurities which made it almost or quite useless. Demand for standardized commercial papain caused a considerable improvement of the conditions under which Ceylonese latex was prepared, but apparently even greater improvements can be made. It is perhaps in the use of improved methods that American papaya growers may hope to compete with the Asiatic market.

Rapid Drying Improves Quality.

Several experimenters have expressed their view that scientific methods of handling the papaya latex should result in the production of papain of far greater enzymatic activity than that of the ordinary product in the past. Rapid drying of the latex is essential, for the papain loses its activity at once if fermentation is allowed to proceed. While good grades of papain can be produced from clean latex which is rapidly dried in the sun, far better grades—probably four times as active as commercial papain—may be made by drying the latex over

sulphuric acid or by precipitating it in alcohol. While these methods involve more investment and expense than the traditional sun-drying technique, it would seem that the improved product should command a correspondingly higher price.

Also interesting is a technique by which papain may be obtained from the juice pressed from ground leaves. This process, recently developed in Hawaii, seems to deserve commercial exploitation if the demand warrant, for through it, it should be possible to obtain the enzyme from plants too young to bear fruit or from staminate plants. The investigators who developed the process found that yields of papain from leaves were comparable in amount to those obtained from the fruit by ordinary methods.

The milky juice dripping from the cuts on these fruits is the source of papain.

Fruit Production Offers Problem.

When grown as a fruit tree, the papaya presents one serious problem: the plants usually bear only male or female flowers. Since only the female (pistillate) trees produce fruits and since among seedling plants the number of male (staminate) plants usually equals or exceeds the number of females, though only about one staminate plant is required for the pollination of ten pistillate plants, it is necessary to determine the sex of a plant before according it a place in a permanent planting. This naturally involves unnecessary effort on the part of the grower, not to mention the space in a large plantation occupied by staminate plants. Breeding problems now well under way are aiming at the production of true-breeding pistillate or bisexual races, so desirable from the grower's standpoint.

For the production of papain, however, the sex of the plant is immaterial. If methods of extraction from leaves and other vegetative parts can be developed on a commercial basis, the grower can perhaps combine fruit production with that of papain in a more satisfactory way than has ever before been possible.

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ALONG THE *Agricultural Front*

▲ New Economic Link Between the United States and Mexico

The opening session of the Mexican-United States economic commission, held late in May in the Department of Commerce, was a result of the reciprocal visit made by President Roosevelt and President Ávila Camacho in Mexico and the United States. The joint commission of experts planned to formulate a program for economic cooperation between the two countries.

The Mexican members were Mr. Evaristo Araiza, General Manager of the Monterrey Steel Works, and Mr. Valentin R. Garfías, a well-known mining engineer. Representing the United States were the Honorable Wayne C. Taylor, Under Secretary of Commerce, and Dr. Harry White, Assistant to the Secretary of the Treasury. Their assistants included technical advisers from interested agencies of both Governments.

The commission planned to meet from time to time within a 30-day period. After a number of sessions in Washington, the experts and their advisers expected to go to Mexico for a short time and then return to Washington to complete their work.

▲ Abacá and Balsa Development in Costa Rica

From 800 to 1,000 people have been employed at Costa Rica's abacá plantations developed in the Province of Limón. Despite the fact that between 200 and 300 laborers and subforemen were brought over from the Pacific coast, the plantations have been the single greatest new source of employment during the past 12 months. Hailed both as manna from Heaven and as Costa Rica's contribution to the war effort, the abacá project is one of the greatest factors in the economic comeback of Limón.

Another activity that is expected to expand is the export of balsa lumber to the United States. Balsa wood is used in the manufacture of life rafts and aircraft. Since the International Balsa Corporation opened its office in Port Limón in November of 1942, balsa shipments have increased, but it is believed that these are only a beginning compared with the anticipated expansion.

▲ Roselle Plantings in Cuba

Cuba, acting on the recommendation of a commission which studied roselle production in El Salvador, is proceeding with experimental plantings of roselle to substitute for jute formerly imported from India. Results of this experimental production are being carefully watched to determine whether roselle can become a source of soft fiber for sugar bags.

In compliance with a request for assistance from the United States Government in obtaining roselle seed, 500 pounds of the seed were shipped from El Salvador to Cuba in December, and a representative of the Board of Economic Warfare entered into contracts with eight colonos (sugar growers) and centrals to plant specified areas of roselle for the production of additional seed. The eight contracting producers were furnished with free seed at the rate of about 3 pounds per acre and were guaranteed 5 cents a pound for delivered seed with a specified minimum payment per acre.

A considerable quantity of seed probably will be obtained, even though plantings were made out of season and have been subject to drought and insect damage. Judging from the earliest plantings it should be possible to harvest the seed in about 5 or 6 months after planting.

The other Latin American countries cooperating with the United States Government in the roselle experiments are Nicaragua, Honduras, Colombia, Guatemala, and Costa Rica. Fiber authorities admit that roselle probably could be used instead of jute for burlap bags, ropes, cord, and many other purposes. The advantage of roselle over jute is that it "rets" more easily. Retting is the soaking process by which the fiber is separated from the stalk and bark. Only 10 or 12 days are required, compared with 3 weeks for jute. Another consideration is that roselle can be produced quickly and with less labor than jute. On the other hand, roselle requires farmers trained in raising it, and handlers and processors trained in grading and processing it.

▲ Vice President Wallace at Farm Fair in Panama

A farm fair was being held at David, in the Province of Chiriquí, when Vice President Wallace arrived in Panama. Such demonstrations were called by Mr. Wallace "an inspiration for the future of the world."

"Wherever a people is oppressed by hunger," he said, "that people is an easy victim to the theft of its liberties. A tyrant needs no greater alliance than an alliance with hunger."

He congratulated President de la Guardia and the Minister of Agriculture on the agricultural progress of their country. The rest of his brief talk was devoted to tracing the evolution of fairs from early religious festivals to modern expositions.

President de la Guardia announced that the fair would be an annual affair, under the sponsorship of the National Government. The Province of Chiriquí is the outstanding agricultural area in Panama.

▲ Dehydrating Bananas in São Paulo, Brazil

There are two banana-dehydrating plants in Santos, State of São Paulo, Brazil, one for producing flakes; the other factory, established in 1930, makes three types of dehydrated banana products: flour, dried, and preserved fruit.

To the first factory, which is the larger and more modern of the two, are brought stems of the *Musa Cavendishii*, a sweet banana known locally as the "nanica" or "canaria." These stems, which are converted into dehydrated-banana flakes, are too small for export.

The fruit, before being processed, is conditioned in a hothouse from 6 to 12 hours and then stored for 2 or 3 days in a ventilated room to ripen. The bananas are skinned, placed in a drum where the oxygen is removed by adding carbonic acid, and then whipped into a cream. This cream is piped to a dehydrator and spread in thin films on a cylinder heated to about 360° F. The dried film is placed in an air-conditioned chamber, ground into powder and packaged by hand. The resulting banana flakes are straw-like particles that taste and smell like bananas. Three hundred tons are required to produce 30 tons of flakes.

The second banana - processing plant uses essentially the same method.

▲ Cinchona Agreement With Ecuador

The cinchona agreement between Ecuador and the United States, under negotiation for several months, was signed in March. Under the terms of the agreement, Ecuador will sell to the Defense Supplies Corporation of the United States all the cinchona bark not required for domestic consumption. The Ecuadoran Development Corporation has been made the agent of the Defense Supplies Corporation and is responsible for the intensification of the development, production, and shipment of cinchona bark, as well as for the improvement of the manufacturing of quinine products in Ecuador.

Although the provisions of the agreement were directed toward increasing quinine supplies for the United Nations war effort, they were also designed to establish a permanent industry in Ecuador. The United States will send trained botanists to survey the stands in areas producing cinchona bark. Chemists will follow with field laboratories and make analyses of quinine and alkaloid content of cinchona bark. Then the bark will be gathered in a manner designed to obtain maximum yields without destroying the alkaloids or eliminating the stands. The exploitation of existing stands shall be commensurate with experimental plantings so that seedbeds, nurseries, and new plantations will aways be available. As soon as these surveys and analyses are completed, an extracting plant will be built and will expand to produce, first, totaquina and, later, quinine sulfate.

Meanwhile the program will be gradually staffed by Ecuadoran nationals trained by United States technicians in all the operations from planting to processing.

For Ecuador, the advantages of the undertaking are varied. In addition to the new industry itself, from which profits for many may accrue, quinine may be made available for even the poorest Indian. Another asset, and an important one from the point of view of the nation's economy, is the emergence of a new export product.

Bolivia and Guatemala have already taken the lead in the Americas and are building a progressive program which is expected to yield a permanent supply of quinine. Ecuador is following the same pattern.

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AGRICULTURE IN THE AMERICAS HALLY H. CONRAD, EDITOR

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Gifts of the Americas

MAIZE

by A. E. LONGLEY

Maize, or Indian corn, filled the granaries of the agricultural people of the Western Hemisphere as far back as the earliest records go. Maize always has been the most important agricultural crop of the Americas, and today it is grown extensively in temperate and tropical regions over the entire world. The Indians of the past developed this cereal to assure themselves an adequate food supply. It is likely that in the next few years of stress and strain corn will be even more important, since the Americas may be called on to become the granary of the world.

Maize is adapted to extreme differences in climate, and no grain has such a variety of forms. It is edible and nutritious long before maturity. When dry, the naked seeds are shelled easily from the cob, and if treated against insects they may be stored for a long time. The general seed types are sweet, pop, flint, flour, and dent, each of which has numerous subdivisions. Commercial corn is generally white or yellow in color, but varieties, grown by the Indians are red, blue, black, brown, pink, purple, variegated, and spotted.

When Columbus discovered America, Indian corn was used primarily for human consumption, but the white man soon found that not only the grain but the whole plant was relished by his flocks and herds. Today corn constitutes one of the principal livestock feeds of the world.

This unique cereal, although widely cultivated, is still unknown as a wild plant. Several theories have been advanced as to the appearance of maize before man domesticated it, since it is so specialized in structure that without man's aid it would become extinct in a few years.

The time when man began to improve primitive maize is uncertain. Archaeological records go back several thousand years, and yet they fail to show any noticeable difference between the maize of today and that of ancient times. Botanists believe that it must have taken many centuries to develop such a highly specialized cereal plant.

Locating the place where man first brought maize into cultivation has baffled archaeologists, botanists, and agronomists alike. Peru is richest in corn varieties, but some feel that this is due to long cultivation in a region where isolated valleys prevail. Consequently, variations in Peruvian maize may not be a true measure of antiquity. A second school thinks of Guatemala and Mexico as a region where maize culture began.

The type of agriculture practiced by the early people of the Western Hemisphere is truly American and is based on individual plant culture, which is in marked contrast to the Old World method of seeding and harvesting cereals in mass. The development of maize may have been closely linked with this American type of agriculture, since the change from a wild to this domesticated plant could hardly have taken place under the Old World system. The world is deeply indebted, therefore, to the labors of the early plant breeders for this most remarkable of all cereals.

PARAGUAY

Land

Paraguay, like Bolivia, is one of the two inland countries of South America. Unlike Bolivia, however, it is not landlocked, having access to the Atlantic Ocean by means of the vast Paraná-Paraguay River system. The area of the country in 1939 was estimated at 169,266 square miles. This is just about equal to the size of New England and New Jersey, New York, and Pennsylvania combined.

For purposes of graphic presentation, the country may be said to be divided by the Paraguay River into two regions. The section east of the river is traversed from north to south by a broad, irregular belt of highlands that are a continuation of the great interior plateau of Brazil. This part of Paraguay is heavily forested, and elevations only occasionally exceed 2,200 feet. In the forest clearings, where nearly all the agriculture is carried on, the soil is extremely fertile.

The section west of the river consists of grassy plains, with occasional forest-covered hills, drained by the numerous streams flowing into the Paraguay River. These plains are well-adapted to the raising of livestock.

Climate

About 66 percent of Paraguay lies within the Temperate Zone, and the remainder in the Tropics. The climate is subtropical, but it is modified by the mountain chains and the extensive system of waterways. Rain is abundant throughout the year.

Population

On December 31, 1939, the population of the country officially was estimated at about 988,000 persons, indicating an average density of about 5.8 persons to the square mile. About 95 percent of the Paraguayans live in the eastern section of the country, however, and perhaps a fifth of the total in Asunción, the capital, Villarica, and other cities.

Agriculture

The national economy of the country is basically agricultural and pastoral. The principal crops grown are corn, cotton, mandioca, potatoes, peas, rice, peanuts, sugarcane, and tobacco. Most of these crops are produced to some extent throughout the eastern part of the country, but production is concentrated in the southeastern area east of the Paraguay River. Rice and potatoes are grown more extensively in the Paraná region, where there is also some production of castor-beans and tung. Oranges generally are grown south of the twenty-fifth parallel and west of the fifty-sixth meridian. Bananas are produced in most parts of eastern Paraguay. Yerba maté is found extensively all along the eastern boundaries. Dense quebracho forests extend along the west side of the Paraguay River in the Chaco region. The Chaco, Concepción, and Misiones regions are particularly well adapted to cattle raising.

The chief exports of Paraguay are agricultural, pastoral, and forest products—beef products and cattle hides, cotton, quebracho extract for tanning, yerba maté, tobacco, essential oils, logs and lumber, oranges, and tangerines.

The country's principal imports consist of foodstuffs, cotton cloth, metals and metal manufactures, machinery and apparatus, vehicles, and petroleum.

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IN THIS ISSUE

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NAMES & NEWS

Distinguished Visitors

Sr. Manuel Casanueva, Director General of Agriculture of Chile (a position roughly corresponding to that of Chief of the Bureau of Agricultural Economics in the United States) is in this country as a guest of the Department of State. Sr. Casanueva is interested in general aspects of agriculture, particularly administration, research, and economics. After representing his country at the United Nations Conference on Food and Agriculture at Hot Springs, Va., as Chairman of the Chilean Delegation, Sr. Casanueva spent some time in Washington and is now on a swing around the country, visiting many laboratories, stockyards, grain elevators, experiment stations, state agricultural officials, and Extension Service officers.

Attending a recent series of Washington conferences arranged by the United States and the Colombian Governments to develop agricultural collaboration between the two nations were *Miguel López Pumarejo,* President, Caja de Crédito Agrario; *Manuel Gómez Rueda,* Manager, Colombian Livestock Association; *Rafael R. Camacho,* Agronomist, Caja de Crédito Agrario; and *H. V. Geib,* Agricultural Adviser to the American Embassy in Colombia.

Dr. París E. Menéndez, Director of the Central Laboratory in the Ministry of Agriculture, Commerce and Industry of Paraguay, is spending about 6 weeks in the United States, under the auspices of the Food Supply Division, Office of the Coordinator of Inter-American Affairs. Dr. Menéndez represented Paraguay at the United Nations Conference on Food and Agriculture.

Recent Appointments

Senhor Alfredo Dominguez da Silva, who was one of Brazil's delegates to the United Nations Conference on Food and Agriculture at Hot Springs, Virginia, has been appointed Agricultural Attaché to the Brazilian Embassy in Washington. Before his present assignment, Senhor Dominguez was a fiber technician in the Brazilian Ministry of Agriculture.

George L. Crawford has been named by the Institute of Inter-American Affairs to work with Venezuelan agriculturists on a program to grow more food for home consumption. Before his assignment to Venezuela, Mr. Crawford headed the Department of Agriculture's Soil Conservation Service in Puerto Rico and the Virgin Islands.

The other agricultural specialists assigned by the Institute to Venezuela are *William G. Kincannon,* Agronomist; *Charles E. O'Neal,* Senior Animal Husbandry Specialist; *Romualdo Bias,* Senior Refrigeration Engineer; *William L. Simmons,* Soil Scientist; *Otto L. Hubp,* Assistant Dairy Husbandry Specialist; and *Edward J. O'Brien,* Senior Administrative Officer.

Philip Leonard Green of the Office of Foreign Agricultural Relations has been appointed Executive Editor of "Agro-America," official journal of the newly established Inter-American Institute of Agricultural Sciences and of the American Society of Agricultural Sciences. "Agro-America" will be published as a quarterly with articles written in the four official language of the Americas.

Agriculture IN THE *Americas*

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Planning for Tomorrow's Harvests

When meeting together at Hot Springs, the representatives of the Allied Nations laid the foundations for future world planning. From such concerted efforts should come better food and happier peoples.

The Under Secretary of Agriculture

by PAUL H. APPLEBY

The Hot Springs Conference on Food and Agriculture closed its sessions early in June. Its formal product was the adoption of 30 resolutions including recommendations on nutrition, food production, and distribution, and proposing a permanent international organization to help carry them out.

The Conference itself, in its make-up and functioning, was equal in significance to the specific actions it agreed to recommend.

The Conference was representative of all 44 of the United Nations, great and small. This first discussion looking toward great post-war work to come was not an ordering of the world's picture by the great and powerful among the Allies, but rather a democratic meeting of representatives from all the free peoples allied against the Axis. All had an equal chance to be heard; all participated and contributed.

Throughout, the Conference centered its attention on how each nation could best solve its own problems. The emphasis was not on solving the problems of poor countries by aid from the well-to-do nations, but on helping each country to help itself, and on working together to that end. All recognized that mutual self-interest would lead to international efforts, technical and otherwise, to help individual countries to solve their own problems and raise their own levels of production and welfare.

Out of this consideration of mutual action came the recognition of the necessity of concerted policy. When nations attempt to solve economic problems single-handed, they tend toward efforts to restrict output or international trade, efforts which often impair the welfare of other countries. When nations work together on their policies, they can see whether or not what all are doing adds up to make a unified whole. That the world can be better fed only if more food is produced and consumed is obvious. Many nations trying to carry through such expansion programs as a concerted undertaking will have much better prospects of success than any one nation attempting it on its own. Each nation will be supported in its actions by the assurance that other nations are taking parallel action.

Agreement as to the importance of concerted policy was supported by a most extraordinary agreement as to what that policy should be. The years since 1929 were found to have induced very similar thoughts everywhere. The Conference put first emphasis on ends to be achieved, and then it turned attention to methods as merely means to the larger ends.

The Conference realized that ideas and expectations are facts which themselves can help shape events. By establishing the expectation everywhere that both business and trade will expand after the war, that more food will be produced, and that people will be better fed, public and business policy and action will surely be

affected and thus will help to bring the expansion about.

All recognized that men could now begin to think forward to what could be done after the war to use the vast productive resources of the world to make life better in every nation, to attain new standards of health for people everywhere. War has got production going at full-blast levels never reached before. Those levels of production must be kept afterward and used to meet fully the needs of peace.

As one basic step toward maintaining these higher levels, the Conference looked to an acceptance by all nations of a new responsibility to their own people, and to each other, to see that all people of the world are better fed.

Another step designed to stimulate action everywhere was the proposal that each nation report at regular intervals what it had done toward achieving the Conference objectives.

Wartime shortages and rationing have made people realize once more how fundamentally important food really is. The Conference capitalized on this fresh awareness of food, the new scientific knowledge of the kinds of food needed for health, and on methods of proper production.

There was, of course, great and special significance in the full and enthusiastic participation of Russia in this common approach to post-war problems.

Also a great significance was attached in the Conference to the vivid expression of the difference between Axis war aims and Allied war aims. Instead of a master-and-slave world, the objective in the Conference was toward a collaborative world, in which there should be enlarged opportunities for everyone, everywhere.

Another fact of enormous significance was that the representatives of 44 friendly nations worked together in great and growing personal friendship. In this connection, our years of working together in this Hemisphere have established a tradition of friendly collaboration which proved a factor in facilitating the fruitfulness of the Conference.

The proposal to establish a permanent international organization to deal with food and agriculture was significant as a specific step toward continuing international collaboration on a day-to-day basis. New means are needed if we are to work together to handle and solve the mutual problems as they arise.

Finally, of particularly great significance was the fact that the Conference marked the first gathering in history, attended by representatives of most of the nations of the world, to give the problems of agriculture and food such emphasis and undivided attention. The discussions centered on the welfare of farmers—two-thirds of the people of the world who are engaged in producing food and fiber products—and on their place in the future expanding world economy. These were appropriate subjects of this first great international effort to address the problems of the post-war world.

Hence the discussions throughout the Conference centered around agriculture. Most of the more than 30 sets of recommendations were concerned with the agricultural industry in one way or another. The other big subject was nutrition. But nutrition and food production are inseparable. Thanks to modern advances in science, nutritionists can tell us today what we need to eat for life and health. Farmers must make that knowledge practical.

Among the many recommendations of the Conference of particular interest to farmers, a few stand out in my mind as high lights. (And here one should emphasize that this Conference was confined to making recommendations. It could not commit governments to action. It explored what might be done—but with the hope and belief that its recommendations would have an influence on future action.)

Conservation farming and help to farmers in carrying out conservation farming were in the forefront of the recommendations. Nations need to do far more conservation farming if they are to make the best use of the world's productive resources.

All agreed that for the long-time pull, after post-war needs are met, nations should produce more fruits and vegetables, milk, and meat for their own people. That is in line with everything known about nutritional needs. There was a good deal of discussion of how this could be done.

Certain other crops, such as wheat for example, should, for the long pull, be concentrated in those areas of the world best suited to growing them. These crops can be stored and shipped easily, whereas many of the more perishable crops cannot be. Such an arrangement should go a long way toward relieving the problems faced by the natural single-crop areas during the past decade or so.

Everything possible should be done to see that farmers have a reasonable return for production. This question came up many times.

Improved farming methods should be put into effect as rapidly and as widely as conditions in different countries permit. Research and educational work—including what is known as Extension Work in the United States—should be actively pushed and supported. United States farmers will surely agree with that.

Markets should be improved and extended. The possibility of narrowing market margins should be closely studied. Standards and grades should be extended to protect farmers both in selling their products and in buying materials they need for production.

These are only a few of the many agricultural problems considered by the Conference, in committees made up of people technically trained in different fields, and coming from many different countries.

Just as significant for farmers was another point. If the people of the world are to be adequately fed—and they can be if we make full use of modern knowledge of production—there must be industrial expansion as well as agricultural expansion. There must be full employment to create greatly increased purchasing power. Farmers' sons in the overcrowded agricultural areas of the world must have opportunities to work in industry and trade, when no real opportunities are to be had on the farm.

In other words, the barriers to opportunity must be progressively broken down, the barriers that shut off markets for agricultural products and force farmers to hold down production when every farmer's instinct is to produce all the earth will yield, the barriers that deny work to unemployed men, the barriers that prevent human beings from getting the food they need.

Is there not great promise of better things to come when representatives of 44 nations can get together and agree on such principles as these—and provide for a continuing organization, as was done at Hot Springs, to put these principles into effect and see that they do not die? Such results point to the realization of the hope that the men who come back from World War II will find what they want most of all—work worthy of the sacrifices they are making for the sake of a better world.

If everyone starts with this idea in mind it will in itself have an effect. After World War I the ideas of self-contained, shut-in nations prevailed, narrowing opportunities, and another great conflict resulted. This time, may all the Allied Nations hold to the idea of a world in which nations will work together to do what no one nation can do alone. By following this course, we can look forward to a world of expanding opportunities and a more enduring peace.

Acme Photo

The United Nations Conference on Food and Agriculture opens at Hot Springs, Va.

Brazil Expands Its Silk Culture

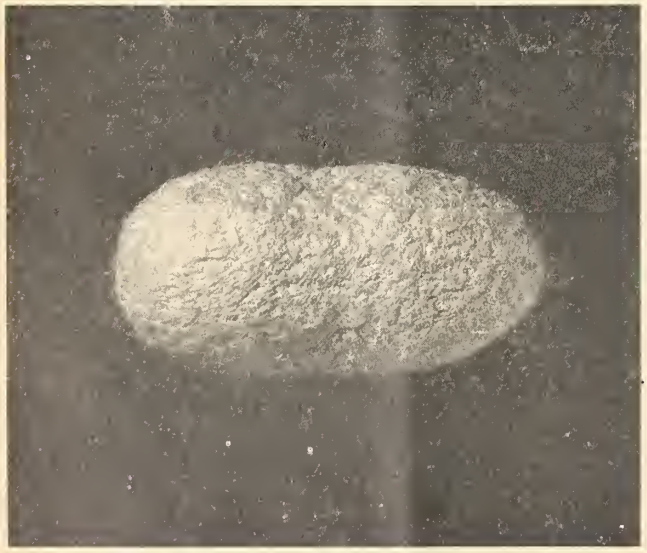
Silk is needed for the war effort, and Brazilian agriculture needs diversification. These factors, combined with favorable climate and soil conditions, may make Brazil the future center of Western Hemisphere silk production.

by GEORGE E. ADAMES

In the State of São Paulo, Brazil, thousands of acres of fertile land are given over to the production of food for worms; and that acreage is being increased rapidly, for the little worms have assumed a great importance to Brazil and to the United States. It is the silkworm of which we speak, and silk has become a vital war commodity.

For many years the Brazilian climate and soil have been recognized as extremely favorable to silk production; and now that the former import sources of silk have been almost entirely cut off, Brazil finds that it can produce silk on a commercial scale. Offers by the United States of greatly increased prices have caused a spurt in Brazilian production of raw silk, and sericulture (to use the technical term) may soon be one of the important occupations in São Paulo, where over 95 percent of Brazil's silk is produced. Mulberry trees, which supply the silkworm with its preferred food, have increased in number from 10 million under cultivation in 1940 to 30 million in 1942.

Since the beginning of the war, when, first, European and, finally, Japanese sources of silk were cut off, all the silk reserves in the United States have been earmarked for military utilization. Silk is the only material known that is completely satisfactory for making ammunition bags, because it disintegrates completely when the charge is fired, and so does not foul the barrels of large-caliber guns. Furthermore, the great strength of silk in proportion to its weight makes it eminently suitable for certain other wartime uses, such as the manufacture of parachutes.



Cocoon of *Bombyx mori.*

Brazil has been interested in silkworm culture since the early part of the nineteenth century, but lack of unified direction and instruction hampered the growth of the industry. During the reign of Dom Pedro II, in 1845, sericulture was undertaken in what is now the State of Rio de Janeiro, but it was a financial failure. Other attempts were made in the State of São Paulo during 1850 and 1876. These efforts were also unsuccessful because of the lack of a market for cocoons and because of insufficient technical organization. Italian immigrants and, later on, Japanese immigrants continued, however, to breed silkworms on a small scale with a reasonable amount of success.

During the past 2 decades, interest in silk culture has revived and expanded, gathering impetus all the time. As far back as 1923 the production of raw silk was subsidized by the Government. By 1940, 3 reeling mills, or filatures, with a total of 273 reeling basins, were in operation in the State of São Paulo. By the end of 1942 there were 25 filatures in operation, with a total of 619 reeling basins. In the same years, 1940–42, the production of silkworm eggs increased from about 400 to 880 pounds; and 1943 production is expected to be in the neighborhood of 2,350 pounds. That represents a tremendous number of eggs, at an estimated 500–700 thousand to the pound.

Federal, state, and municipal aid have fostered the industry. Regional stations have been set up to serve as centers for experiments in breeding and for diffusion of information. At these, interested parties can obtain silkworm eggs and slips of mulberry, free of charge, upon presentation of evidence of responsibility. The official center of Brazil's silkworm industry is the "Regional Inspectorate of Sericiculture" (or "Sericulture"—both forms having the same meaning) at Barbacena, Minas Gerais.

The State of São Paulo is, however, the real center of

the industry, particularly in the districts around Campinas, although silkworm culture is fairly well spread all over the State, there being large mills at São Paulo, Lussanvira, Bastes, Baurú, Piracicaba, Marília, and other cities.

The climate of São Paulo is suitable for the raising of 3 or 4 crops of cocoons a year, as compared with 1 or 2 in Japan; and in the Amazon Basin, by the way, one can raise, with proper precautions, 10 or 12 crops of cocoons each year. Obviously, then, Brazil possesses a great potential for silk production.

Can Be a Pin-Money Occupation

Brazil is fostering sericulture for another reason; namely, silk culture can be handled efficiently by women, older people, and children, thereby freeing the men for other work. One of the informational releases of the State of São Paulo says in part: ". . . The well-managed breeding of 30 grams of eggs . . . means a return of 675$000 [$33.75]. This is a sum which a boy or girl, a woman or an older person can gain with each 28–35 day breeding period. There can be at least four breeding periods a year, which means a return of 2:700$000 [$135.00] per year for relatively light labor; all this in the shade and with greater comfort than that of workers who have to labor in the free [open] air, exposed to the rays of the sun."

The prospect of easy money is alluring, and sericulture is increasing with great rapidity. The Service of Sericulture has prepared calculations showing that the profits of silk culture in São Paulo, the center of the industry, are higher, per acre, than those from coffee or cotton.

On the other hand, the Brazilian Government is being careful not to foster a "boom" or "bubble." Because of the unpredictability of the world silk market after the war, people who anticipate starting silk culture are warned that they should not devote all their energies to the one acitivity. They are even advised to plant a crop of, say, beans between the mulberry trees. In all respects, the Government tries to show farmers that sericulture just at present should be regarded as an adjunct to other farming actitivities. The Ministry of Agriculture, however, emphasizes that silk culture can well be an important subsidiary crop, since its season of activity does not interfere with coffee growing and only slightly overlaps the period of cotton production.

Since American standards for silk are rigid, the Brazilian Service of Sericulture is equipped with the most modern scientific devices, most of which came from the United States. Brazilian technicians have done a remarkably good job of research and investigation. The Sericultural Institute developed two new races of hardy silkworm larvae—the "Brazilian super golden" and the "Campinas yellow"—which produce silk of excellent quality.

Silkworms on mulberry leaf.

Eggs are microscopically examined to insure freedom from disease, and sericulturists are constantly kept informed of improved techniques. Government-sponsored information services encourage breeders to employ improved methods, the best varieties of eggs, and other devices to raise and maintain the standard of the product.

Furthermore, breeders must be taught the proper way to raise and to care for the mulberry tree, for this provides the silkworm with food. Ninety pounds of fresh mulberry leaves are required to supply food for the larvae of one gram of eggs; in other words, about a thousand of the voracious little larvae can in 30 days or so eat all the leaves of 4 to 8 trees.

The genus *Morus* mulberry—has five species; but *M. alba*, *M. nigra*, and *M. rubra* are the most important, in the order named. *Morus alba*, of Asiatic origin, is practically the only species planted in Brazil; and silkworms fed from its leaves seem to produce the best silk. It grows and propagates rapidly and would probably reach some 50 feet in height were it not for the pruning it undergoes.

Trees are usually propagated by cuttings, because this is the quickest and easiest way to start a mulberry plantation. *Morus* thrives in Brazil and is relatively free from disease. Trees are pruned while young to give

them proper shape and to help keep them down to a convenient height for leaf gathering. Many producers do not allow their trees to attain a height of more than 6 feet—this being known as "dwarf" culture.

The mulberry tree provides the silkworm with its only food, for the larva prefers it to anything else. Moreover, the leaves must be carefully prepared. They must be absolutely fresh, they must be stripped from the tree in a certain manner, they must not be gathered in the heat of the day, and they must not be wet when used. In the early days of the larva's existence, the mulberry leaves are usually chopped to the consistency of pipe tobacco, for, although at that stage the young larvae can cut the leaves before eating them, they find the chopped leaves more desirable.

The Helpless Silkworm

The silkworm, whose full name is *Bombyx mori*, is an amazing little creature and, if it had a mind, might prove to be a great pet, for it has been domesticated for an estimated 5,000 years. Since it is the ephemeral slave of man's desire for adornment, its existence is entirely dependent on man. After 50 centuries of being sheltered from the vagaries of nature, *Bombyx mori* is delicate and must be cared for and fed like the baby that it is. The moth is less than an inch long, unable to fly, and the larva is subject to diseases. For these reasons, among others, breeding requires training and close attention.

Mulberry tree, showing dwarf pruning.

On the other hand, man is selfishly interested in only 4 or 5 days in the insect's life—those days when it spins a cocoon about itself so as to have shelter while changing into a moth. Man is willing to care for the larva for a month or a month and a half, because the cocoon contains from 1,000 to 1,500 yards of filament that is made into the most luxurious of all fabrics—silk.

Practically speaking, the breeder never sees the pupa or the moth. His concern with *Bombyx mori* is of short duration only. In order to obtain cocoons from a few ounces of eggs the Brazilian breeder proceeds somewhat as follows:

He calculates the number of eggs that his mulberry grove can support and then applies at his regional sericulture station for the correct amount. Eggs are usually distributed in units of 1 ounce or about 30 grams, following the European custom, each unit amounting to about 45,000 eggs.

The eggs are spread out in shallow, open, wooden, or cardboard boxes or trays, and kept at a temperature a little higher than 70° F. Within about 10 days, the eggs begin to hatch, this operation usually extending over several days. Sheets of stiff paper punched with small holes are spread upon the hatching trays, and very finely chopped mulberry leaves are spread on top. The newly hatched larvae are attracted by the food and creep upward through the holes to start feeding. Successive "births" are removed to other trays.

From this time forward, the larvae fulfill their destiny on these trays, in a dry, well-ventilated but warm brood house, called a *sirgaria*. The *sirgaria* is generally close by, or even in, a grove of mulberry trees, in order that fresh leaves may always be available. Feedings are administered at frequent intervals—six or eight times a day to newly hatched larvae—and the brood does nothing but eat, making no attempt to escape the trays.

Silkworms grow from 0.03 inch in length to about 3.5 inches in their 30 days of feeding. Four times during their growth they cease eating and rest immobile for about 24 hours while sloughing off their outgrown skins. This moulting usually occurs on the fifth, eleventh, seventeenth, and twenty-third days after hatching.

At about the thirtieth day, the larvae become restless and refuse food. At this time, branches of dry brush or broom, called the *bosque*, or forest, are provided. Soon their bodies become semitransparent, the silk-making glands swell, and the larvae climb up into the *bosque* and start to wrap themselves in cocoons.

The spinning of the cocoons usually takes about 3 or 4 days, and the harvest is effected on the forty-first or forty-second day after hatching. From that time on, different breeders use different methods of disposal.

Brood house for silkworms among mulberry trees at Cosmopolis, São Paulo, Brazil.

Unless the cocoon is to be handled promptly at a nearby reeling mill, the pupa must be killed. This is usually effected by heat, either steam or dry, though preferably the latter, since the cocoons must be thoroughly dried.

If the breeder does not do the killing, or suffocating, as it is called, it is done at the reeling mill, or filature. Here, the cocoons are also scoured to remove the gummy sericin on the outside and to enable the operator to discover the master filament. From 4 to 14 cocoons thus prepared are placed in a basin of water. The number is ordinarily about 6; and the filaments are brought together, passed over various supports, and twisted together on a square reel. Simple machinery causes the cocoons to unwind, producing 1,000 or 1,500 yards of silk, only about 750 yards of which is of first quality. The resulting skein of yarn is marketed as raw silk.

Sericulture is not difficult, although tedious. It has been launched under government guidance, at one time or another, in nearly all the countries of both the Americas. Some of these experiments have been recent—in Costa Rica in 1926; Argentina, 1936; Chile, 1939; and, surprisingly enough, in the United States in 1941. Because of the climate and labor supply, however, silk seems to have got a good start in Brazil and has a fair chance of attaining importance in the Brazilian economy.

Brazil Thinks Ahead

Furthermore, the establishment of sericulture on a commercial scale fits in perfectly with the Brazilian Government's efforts to effect a diversification of the national agriculture. Brazil has learned a lesson from its former dependence upon a single crop. Many former coffee growers took up the cultivation of cotton, and in the same way some farmers are now beginning to consider silk as a subsidiary crop.

The silk industry has received an enormous stimulus from the war. Quotations per pound for Brazilian raw silk now exceed by as much as $2 the pre-war prices of the Japanese product, and the present war, if sufficiently prolonged, may give Brazilian silk a chance to become securely established. Moreover, the reeling process, the cost of which has always operated as a deterrent to silk production in the Western Hemisphere, can be carried on relatively cheaply in Brazil.

Thus the immediate future of Brazilian sericulture looks encouraging, but, in view of possible post-war marketing problems, the wisest course to pursue for the time being appears to be that of keeping sericulture as a subsidiary occupation. In this way, its contraction or expansion at the end of the war will bring about a minimum dislocation in the national policy.

Brazil's record production of raw silk in 1942, estimated at 500,000 pounds, seems small when compared with the annual pre-war average in Japan of 95 million pounds. On the other hand, imports of silk into Brazil during the pre-war years averaged about 1 million pounds. Brazil's present economic policy favors the production of sufficient silk to meet domestic requirements plus a surplus for export in exchange for manufactured products and other goods that the country has been unable to produce in sufficient quantity to supply its own needs.

On the other hand, Brazil is aware of the fact that it must plan for a quantity and a quality of production that could compete in the world market with the Japanese product on a price basis. For that reason the Brazilian Government is proceeding carefully, waiting to see what the turn of events will be before putting too many silkworm eggs in one basket, so to speak. For the time being, a well-paying market for silk is assured; if the present good management of the industry continues, post-war adjustments, either downward or upward, will not be hard to make.

General view of reeling basins in filature at Campinas, Brazil.

San Andrés

Important among the research and extension centers operated jointly by the United States and various other American republics is the agricultural experiment station in El Salvador. Here emphasis is placed on producing those crops, now vitally needed, which were normally purchased abroad by the United States.

by LEOPOLDO BARRIENTOS

The site of the *Centro Nacional de Agronomía* of El Salvador, selected by officials of the United States Department of Agriculture and the Salvadoran Government, is in the San Andrés Valley. It covers an area of 600 acres and is bordered by the Pan American Highway and two rivers, the Sucio and the Agua Caliente. From these rivers water is available for irrigation from two directions. Furthermore, except for a section on the highway where the buildings are to be located, the entire area can be irrigated by gravity flow. This is a decided advantage now that machinery and equipment for pumping water are difficult to secure.

The soils of San Andrés are of volcanic origin. They are deep, friable, and dark brown in color—like "chocolate cake" is the apt description sometimes applied to them. With little fertilizer, they produce each year good crops of corn, beans, and sugarcane.

The location of the experimental station has several attractive features that are not of an agricultural nature. Pre-Mayan ruins offer many possibilities for historical study. They give evidence of the advanced stage of civilization reached at one time in this region. One might hazard a guess that some epidemic disease wiped out most of the population, leaving only ruins to testify to the culture, religion, ceremony, and art of those early builders. One can stand on the top of the large pyramids that remain and imagine many things that might have happened there in ages past.

The Volcano of Izalco can be seen from almost all parts of San Andrés. At intervals of about 15 minutes, it sends up a great puff of smoke. An eruption at night often serves as a beacon and landmark for ships off the Pacific coast.

The buildings planned for the experimental station were designed by Mr. Frank Morris of the United States Department of Agriculture. Although they follow a Salvadoran pattern they show the Spanish architectural influence; they will not be elaborate but will be modern and up-to-date in all respects. They will include a main administration building, two dormitories, a school, a medical clinic, staff homes for five families, barns, stables, repair shops, and storehouses.

An organization, known as *Mejoramiento Social* (Social Betterment), has been awarded the contract for constructing the buildings, installing electricity, and providing the water supply and furnishings. The establishment of the experimental station was actively promoted by Mr. Mario Sol, the head of the organization, which was set up to improve farming conditions in El Salvador. Large tracts of land are purchased by it and then parceled out to small farmers at reasonable long-term rates of payments. Homes for the farmers are sometimes built, and one of the settlements adjoins the site of the experimental station. These farmers will be encouraged to try out new practices and plants recommended by the station.

Area designated for experimental plots.

Scope of the Work

The work of the experimental station will be classified under the following heads: Animal industry, plant pathology, agronomy, chemistry, botany, entomology, and agricultural engineering. Other activities will be undertaken, however, as the occasion, or demand, arises.

Several projects have already been initiated despite the

View of the experimental station from the Pan American Highway.

View of the Pan American Highway from the San Andrés property.

lack of buildings and equipment. Twelve thousand derris cuttings, received from Puerto Rico, have been distributed to outstanding farmers, with the exception of those retained for the establishment of a nursery at San Andrés. Cinchona plants from Washington, D. C., are being propagated in Santa Teela in cooperation with the *Asociación Cafetelara de El Salvador*. A rubber nursery is being expanded and is expected to have 300,000 plants in another year. Surveys of the various crops grown in El Salvador have been made. Experiments aimed at solving various problems will be started as soon as land is made available. Plans have been made to study plant sources of edible oils, fiber production, the production of coffee and the control of its diseases, the improvement of corn, beans, rice, and other subsistence crops; to survey the diseases of economic plants; to introduce new plants; and make plant analyses of forage and oil crops.

The various cattle breeds will be studied and particular attention given to their adaptability to local conditions, with the idea of cross-breeding them with the native cattle in order to develop animals that will improve milk and beef production and yet be hardy enought to thrive under tropical conditions. Special attention will also be given to feeding trials, using domestic forage plants, some of which have an incredibly high protein content.

Horses, pigs, goats, and poultry will receive consideration, and up-to-date extension practices will be employed in order to pass on to the farmers all the knowledge and experience acquired at the new station.

When the station is completed and running smoothly, substations will be established in different parts of El Salvador. This will facilitate the testing of new methods and new plants under various conditions and increase the effectiveness of extension work.

Lower section of the pyramids. Probably the remains of a drainage system.

One of the pyramids that has been partly reconstructed.

Education in Haiti

Education in Haiti goes hand in hand with agriculture. Teachers and agricultural extension workers receive much the same training and work together on community problems.

by ALLAN HULSIZER

In Haiti, the aim of education is an immediate improvement of living for all through the school curriculum. This aim has been and is being achieved through a national organization that includes public schools and agricultural extension as branches of the same governmental department, under a Cabinet Minister who has had training both in agriculture and in education.

Practically, the program has a 4-H or Future Farmers' Program as the core curriculum of its schools, with the important proviso that teachers and agricultural experts serve on a joint committee with local leaders for the development and execution of the program. Agricultural teachers take education courses. They place first importance on the development of human beings, in the belief that with better individual and group development, the program undertaken by the individual or group will, in turn, be better.

In Haiti, public-school teachers and agricultural extension agents are prepared in the same national college. They take identical courses in psychology, rural sociology, biology, botany, and agronomy for a part of the 3-year course. Much of the practice work of both is also identical. The main differentiation in the work of the teacher and the extension agent in the field after leaving school is, roughly, that the former deals with children and the latter with adults.

Yet the largest and most successful agricultural producers' cooperative in Haiti was developed by the National Supervisor of Vocational Agriculture in a school-centered community. At a recent Regional Institute of Public School Teachers, each day was divided into three periods about equal in length. The first was given over to shop and craftwork, the second to agriculture, and the third to socialized discussions and developmental planning. The teachers planted a thousand trees as a training exercise. Such projects are considered standard procedure for schools and for agricultural extension, day in and day out.

While many Haitian educators believe in such a program, its widespread acceptance in Haiti was the result of a number of unusual factors. Probably limitations as to personnel and budget were most important. Another resulted from the fact that the language of 95 percent of the population is not a written language; and the reading of the secondary language, French, although important in the schools, does not take precedence over health and nutrition or vocation and industry.

Perhaps the most important factor in setting the pattern for public schools was the inauguration by the Service Technique in 1926–27 of a program for the establishment of 50 farm schools. These schools were centers for teaching better agricultural practices and for the dissemination of improved plant stocks and seeds. The practical research of the students into community activities led them into several creative ventures. The hat-braid industry in Haiti was started in the farm schools; through farm-school encouragement, the sisal and the banana industries spread from plantations to small holdings throughout the various regions of the country.

Parents and businessmen welcomed the Haitian type of practical education because it ignores neither intellectual and social processes nor lay participation and leadership. After the conclusion of the American occupation of Haiti, each administration has given more responsibility to the agricultural service. In 1930 all rural public schools were turned over to the farm-school division, which was called the Division of Rural Schools. Haiti's present administration has combined general with agricultural education; even city schools are under the Ministry of Agriculture and Education.

Practically, the activities of the agricultural department of the Haitian Government are directed toward the development and conservation of natural resources. The Ministry of Agriculture and Education is similar to the United States Social Security Agency, in that public education and agriculture are component parts. Teachers and extension agents, because of their association in educational classes and in community cooperatives, are mutually tolerant and mutually respectful. The emphasis on technical personnel in an advisory capacity to local leaders has helped to promote such mutuality.

How can such a program be evaluated? First, any education worthy of the name must produce disciplined members of society. Graduates of the Farm Schools in Haiti are sought by government and business enterprises

alike, because they are trained to take responsibility, initiative, leadership, and foster *esprit de corps*. "They can be depended on," said one coffee buyer.

Second, Haitian agriculture has shown the effect of applied discipline. In the 10 years after 1930, shipments of bananas leaped from none at all to between five and six million stems. Haitian coffee was formerly graded as seventh in United States markets, but with better preparation, much of it moved up to second place. Rice, previously on an import basis, is now being exported. Sisal production is expanding rapidly as country people find the market for it steady and lucrative.

A considerable part of the advance made by the Haitian people during the 10 years has resulted from the message of the rural teachers to the effect that "cause and effect" is a basic principle in life; that "any situation, within limits, can be improved"; and that "all human beings . . . are endowed with plenty of ability to improve their condition, provided their energies are well directed."

If the improvements under way in Haiti can continue, Haiti will reach the enviable position of being a thickly settled, self-sufficient country, with an acceptable standard of living.

Haitian farm on which the entire food supply for the family is grown. The "ever-normal granary" hangs in the tree

Divi-divi Offers Tannin

Tropical America is the source of many tanning materials. Among them the divi-divi tree and its pods are gaining in significance.

by EDGAR R. BURKLAND

When you admire the beautiful finish on a pair of new boots, a new purse, or a brief ease, have you ever stopped to wonder just what materials were used in produeing sueh a finish and where the materials eame from?

Aside from quebraeho and mangrove, Latin Ameriea supplies the leather industry of the United States with a number of less important tanning materials. The pods of one of the many varieties of *Caesalpinia*, eommonly known as divi-divi, arc a most promising souree of tannins. So far, the *coriaria* speeies is the only one that has assumed a place of commereial importanee in the United States and Europe.

The divi-divi tree is a small one that reaehes a height of only 20 to 30 feet. It is indigenous to various regions of tropieal America—partieularly the islands of the Caribbean, Colombia, Venezuela, Brazil, and Mexico. The name appears to be of native origin and refers to the pods eontaining the seeds as well as to the tree.

The pods, whieh contain a high pereentage of pyragallol tannin, are from 1.5 to 2.5 ineh es long and of a dark brown eolor; they eurl up into a grotesque S-shape on drying. If they are passed through a disintegrator, a rieh powder ean be sifted out, of which the greater part is soluble in water. The belief is that divi-divi pods were first earried from the Spanish Main to Europe in 1768.

These pods, when analyzed ehemieally, are found to eontain from 40 to 50 pereent tannin. About 25 percent is insolubl e matter, 18 pereent soluble nontannins, 13 pereent moisture, and a small amount, ash. Carbohydrates are found in the pods to the extent of about 8 percent.

Tannin is easily extraeted from divi-divi pods by soaking them in hot water. Leather tanned with this produet alone takes on a nice yellowish tint, but more frequently other, more astringent, materials are used in eonjunetion with divi-divi. In addition to its use in the tanning industry, this substanee is valuable in the textile industry for making colors fast.

Sinee the divi-divi tree has not been extensively eultivated, many of its eharaeteristies are not well known. The general belief is that it will live for more than 100 years. The wood, one of the heaviest used commereially in the Ameriean tropies, is quite in keeping with the longevity of the tree. Under favorable eonditions of soil and climate, the tree begins to bear before its eighth year and will yield from 150 to 300 pounds of pods in a season. It usually attains full development in about 20 years. In the wild state more time is required before bearing—

Wild divi-divi trees growing in Curaçao, West Indies.

usually up to 12 years—and the yield is ordinarily much less than when cultivated.

The area of distribution of native trees ranges from sea level up to an elevation of 600 feet. While the plant seems to adapt itself well to sterile regions, it flourishes chiefly along the coast of the Caribbean and on the plains of the interior at the foot of coastal ranges. It thrives in the hot lowlands with a minimum amount of rainfall.

Efforts to promote cultivation of divi-divi appear not to have been intensive. Perhaps the most extensive plantings in tropical America have been on the Dutch island of Curaçao, where considerable experimental work has been carried on. About 400 trees are generally planted to a hectare (2.5 acres) on plantations.

When the tree is cultivated, the pods are usually improved, both in size and in quality. They therefore have a higher market value than those grown wild. Pods from cultivated trees are said to contain as much as 20 percent more tannin and to bring a 25-percent higher price. Minor crops, such as yams, manioc, peas, and millet are sometimes raised between the planted trees.

In former years divi-divi pods were not submitted to any treatment whatever before they were shipped abroad. They were simply raked up off the ground and bagged for export by the buyer at the storehouse. Prices were generally low. The pods were customarily shipped in sailing vessels and were stowed with heavy woods that served as ballast. When shipped by steamer, the product received somewhat more careful treatment.

Freight charges have always been a dominant factor affecting the delivered price of divi-divi, because of its bulkiness. Before 1914, rates were usually about $8 per ton of 110 cubic feet from South America to New York. In 1919, however, charges increased to $24 a ton. Afterward they dropped again to about $8.

Before the first World War, Germany practically controlled the South American market for tanning materials, and Hamburg fixed the prices. Since that time American importers have bought directly from Venezuela and

Divi-divi pods—natural size—with leaves; grown in British Honduras.

Colombia on the basis of prices quoted locally. Because of the high freight rates during the war, two extract factories were established in Venezuela, where pure tannin is now removed from the pods by means of a special process. The output is marketed in the form of pressed tablets or cakes said to contain an average of 60 percent tannic acid.

Divi-divi has been of much less commercial importance than quebracho, which is by far the most significant of the tanning materials imported by the United States. Divi-divi first attained importance in 1923, although the volume shipped in amounted to only 1,785 tons and represented but 3 percent of the total foreign tannins imported. This may seem rather insignificant to one who does not readily appreciate the value of tanning materials in general. In reality, in the finished leather article, such materials play an exceedingly important part as producers of acid needed in tanning liquors.

A number of the best tanning materials in the world, including those derived from chestnut wood, oak bark, and hemlock bark, are produced in the United States. Yet among all these none have been found to produce exactly the same kind of finish as is obtained from divi-divi. Now that a second World War has curtailed or cut off such other tannins as gambier, valonia, and myrobalans, the importation of divi-divi has again increased materially. Under scientific methods of cultivation and production, it might well play a more significant role in the future than it has played in the past.

Reading ABOUT THE AMERICAS

Inter-Americana. Short Papers, III. The Cooperative Movement in Latin America: Its Significance in Hemisphere Solidarity, by A. Fabra Ribas (Translation from the Spanish by Ann Light with an Introduction by Richard F. Behrendt). 62 pp; School of Inter-American Affairs, University of New Mexico, Albuquerque, 1943. Much is said nowadays about fostering friendly relations among the Americas and building up hemisphere solidarity. Professor Fabra Ribas considers the cooperative system one of the best means through which the other American republics can increase their productive capacity and build up real democracies. He believes the future of cooperation lies in the Americas, and, after tracing the development of the movement in the Latin American countries, he devotes a chapter to cooperative education, outlines a plan for combining the efforts of the cooperators and educators of the Americas, and finally makes practical suggestions regarding the problems to be solved in setting up an over-all program for attaining cooperative order. A short biographical sketch of the author appears on the inside of the back cover page.

A Guide to the Literature of the Southwest, by Lyle Saunders, 4 reprints from "The New Mexico Quarterly Review" covering a bibliography prepared by the Inter-American Section of the University of New Mexico's Research Bureau in Social Sciences of material published during 1942 dealing with the Southwest. The publications are classified under books, with symbols to indicate fiction and juvenile work, and periodicals, which are listed under subheads into professional, technical, and nontechnical.

The New Chemical Formulary, H. Bennett, Editor-in-Chief; Vol. 6, 635 pp.; Chemical Publishing Co., Brooklyn, N. Y., 1943. A collection of commercial formulae and recipes for making many products in various fields of industry. Although 5 volumes have already been issued, the formulae of all are different, and volume 6 includes a chapter on substitutes for chemicals, metals, oils, rubber, wax, drugs, dyes, gums, and minerals, which makes it especially timely. A 20-page index adds to the usefulness of these new formulae.

Inter-Americana. Miscellanea. Inter-American Economic Cooperation. Problems, Recent Developments, and Prospects, by Richard F. Behrendt; 31 pp., chart; School of Inter-American Affairs, University of New Mexico, Albuquerque, 3 ed., 1943. A useful syllabus for the study of the economy of Latin America and of its relation to that of the United States. The work concludes with a bibliography and a chart of comparative statistics on the population and economy of Latin America and the United States.

El posible implantimiento del cultivo de la rosella en El Salvador, by Felix Choussy, 95 pp.; Talleres Gráficos Cisneros, San Salvador, El Salvador, 1942. Describes experiments and observations on roselle planting. Has 18 illustrated plates.

Labor in Latin America, A Survey, by Ernesto Galarza; 16 pp.; (pamphlet), American Council of Public Affairs, Washington, D. C., 1943. Discusses labor's problems in lands where prices of necessities are rising. Also considers the question of immigration and migration, particularly the Mexican laborer in the United States.

Free Men of America, by Ezequiel Padilla; 174 pp.; Ziff-Davis Publishing Company, Chicago, 1943. In this work the Mexican Foreign Minister traces the long and arduous struggle toward freedom of the individual and national sovereignty in the Americas. Contains a chapter on strategic materials and another on economic solidarity and social justice.

ALONG THE *Agricultural Front*

▲ Inter-American University in Panama

The proposed Inter-American University in Panama has advanced another step toward fulfillment.

First suggested by the Government of Panama, the university was approved by the Governing Board of the Pan American Union, and by the Pan American Scientific Congress of Lima in 1924 and by a similar congress held in Washington in 1940. The Congress of American Ministers of Education, which met in Costa Rica last September, also approved the project.

The most recent development is the passage by Panama's National Assembly of a law authorizing installation of the university in Panama City.

The University of Panama will serve as a nucleus for the new institution, which will be available to students from the entire Western Hemisphere. It is hoped that the other governments and universities of the Americas will cooperate by helping to staff the new project.

Chile is the first nation to express a concrete desire to aid in the educational venture. President Juan Antonio Rios expressed his personal enthusiasm by promising to send a distinguished professor of civil law to be a member of the faculty.

An editorial in La Estrella de Panama discusses the function of the new university: "All the countries of the continent believe that it will work for the future of the Americas. No finer proof of this could be given than the desire of each nation to send one or more of her most talented professors so that we may all get into direct contact with other nations, their problems and their cultures. This university will be a great step toward continental solidarity."

Mrs. Esther Neira de Calvo of the Girls' Lycee of Panama commented on the crossroads angle of the proposed plan: "The day is fast approaching when the Pan-American Highway will tremendously promote inter-American traffic. Panama will better fulfill its destiny by means of this artery and the Inter-American University shall stand on the Isthmus as the Mecca of scholars and students from all parts of the continent."

▲ Forest Missions in Ecuador and Central America

Two groups of forest technicians from the United States Forest Service are cooperating, respectively, with Ecuador and Central American countries in surveying and developing their forest resources.

Panama has quipo, something like Ecuador's balsa, much in demand in Great Britain for mosquito bombers. On the west coast of South America guayacan and madera negra woods are being substituted for lignum vitae, one of the heaviest woods in the world. From Ecuador comes roble, a possible substitute for teak, required for decks of aircraft carriers and other vessels.

An important phase of the survey is to find local woods needed for building bridges along the Pan American Highway. Plans had been made to import prefabricated sections of Douglas fir from Oregon, but the lack of shipping space forced the technicians to concentrate on the woods found along the route of the highway. Timber is plentiful, but it cannot be made available for use until it has been subjected to laboratory tests to determine strength, weight, hardness, workability under cutting tools, and other properties.

Samples of cenizo, bambito colorado, and pizarra woods have been forwarded to the Forest Products Laboratory at Madison, Wisconsin, where they are being tested for these characteristics. So far, the Central American party has collected about 50 promising local woods.

▲ Fishing Operations in Guatemala

A 10-year contract has been signed between the Government of Guatemala and the Compañía Internacional de Ventas S. A., a Panama corporation, for the formation of a Guatemalan company to carry on large-scale fishing operations on the Pacific coast.

The new company, which will be called Productos Maritimos S. A. (Marine Products Corporation), will devote itself principally to the catching, preparing, and exploiting of shark and similar fish. In addition, it will explore adjacent waters for tuna banks and other marine products. The company is authorized to install a factory where fish will be packed and packaged, and to establish plants for manufacturing fish meal, oils, and fertilizer from fish and other marine animals. The use of tin for packing is expressly prohibited because of the scarcity of this strategic material.

The company will pay to the Guatemalan Government an export tax of about $10 per ton on fish liver and on prepared fish and fish meal, oils, and other fish products a tax of about $5 per ton.

Under the contract, technical personnel from the United States will be permitted to establish the plants and teach Guatemalan labor methods and procedures needed in the new industry. Shore space in the vicinity of San José will be leased to the company on a 10-year basis.

▲Food-Production Agreement with Venezuela

A Food-Production Agreement has evolved from an exchange of notes between the United States and Venezuela. Following the signature of the important document, Foreign Minister Parra-Perez made this statement:

"The Government values highly the execution of this *Modus Vivendi* or Agreement whose principal aim is the development of the production of foodstuffs. . . . It is the third of its kind to be signed with the United States . . . and constitutes the most evident manifestation of the mutual cooperation existing between the United States and Venezuela. The first related to the cooperation in the development of rubber production; the second dealt with plans for the antimalarial campaign, and the third we are now witnessing."

Mr. Rodolfo Rojas, Minister of Agriculture, declared that it represents an unequivocal proof of the spirit of cooperation guiding the Government of the United States with regard to its "good neighbor" policy.

Under the terms of the agreement, Venezuela binds itself to create a special office in the Technical Institute of Immigration and Colonization to be known as the Servicio Cooperativo Interamericano De Alimentos. This office will be responsible for the execution of the food plan to be formulated by the Ministry of Agriculture and Animal Husbandry in collaboration with the Food Production Mission to be sent to Venezuela by the Institute of Inter-American Affairs of the United States.

▲Increased Balsa Production in Costa Rica

To aid in the manufacture of Britain's "mosquito" bomber, the balsa prospects of the Americas are being thoroughly investigated. Costa Rica is the scene of a recent expansion of the "tree weed" which is used in airplane construction and marine equipment requiring buoyancy.

The United States Defense Supplies Corporation has contracted with the International Balsa Corporation to develop a balsa program in Costa Rica. Arrangements with International Balsa provide that the firm undertake operation of a 1,500-acre experimental and demonstration plantation to extend existing knowledge of the commercial phase of balsa production. Guatemala is also considered a potential source of increased production to supplement the major supply obtained in Ecuador.

▲Intensifying Cultivation in Guatemala

High municipal officials in Guatemala will form the spearhead of a nation-wide drive to intensify the cultivation of such basic crops as corn, beans, rice, wheat, potatoes, yuca, and vegetables. Summoned by the heads of the Departmental governments, the officials have been thoroughly instructed in all the details of the program to spark the cultivation of basic crops as well as those agricultural products that contribute materials for industry considered indispensable for the war effort.

A social aspect of the project to mobilize the agricultural resources of Guatemala is reflected in the instructions that communal or municipal lands be apportioned among small farmers who lack lands for planting. The large landowners are being asked to cooperate by renting small parcels of land at reasonable terms.

In order to ensure full support of the program, a census of the able-bodied persons in each district is being compiled. Enforcement authorities have been instructed to compel loafers to undertake agricultural work so that everyone shall participate in the labor.

A check is being provided in the form of a detailed and precise report to the Secretary of Agriculture regarding the fulfillment of the instructions and giving an estimate of the amounts planted and the anticipated harvests.

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AGRICULTURE IN THE AMERICAS — HALLY H. CONRAD, EDITOR

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Gifts of the Americas

BALSA WOOD

by W. D. BRUSH

The lightest commercial wood known is that obtained from the balsa tree, a native of the forests of both Central and South America. Because of its lightness, which of course includes buoyancy, this wood is playing a valiant part in the present war.

Currently, balsa has become associated with "mosquito" bombers, the thrilling exploits of which have been made possible partly because of this wood.

The real significance of the name balsa, however, which means "raft" in Spanish, attaches to life rafts. Thus, balsa wood, employed in their construction, performs another great service in this war.

The balsa used in airplane and raft construction weighs (air dry) about 10 pounds per cubic foot, whereas that amount of spruce weighs 28 and cork 15 pounds. The light weight of balsa is due to the comparatively large quantities of air in its cell cavities; this naturally adds to the buoyancy of the wood as well. When used for airplanes, it is combined with other stronger woods, thus adding to the rigidity of the ship without increasing its weight unduly.

When balsa is employed for a raft or float, it is shaped to resemble a link sausage that has been bent to form an ellipse, with the ends joined together, supporting a platform or net in the open central portion. Such a raft, made for the United States Navy, will carry safely from 15 to 60 people, depending upon its size.

When not in use naval rafts are stored on the decks of ships, ready for immediate use in case of trouble. Since wood, unlike cork, absorbs water readily, balsa must be covered with waterproof material to prevent its being water-soaked.

In peacetime balsa wood is in great demand for insulation against heat and sound. It is also particularly suitable for making toys, especially airplanes, and airplane models.

The balsa tree grows from southern Mexico to northern Peru, but nearly all the present supply of wood comes from Ecuador because of favorably located large stands of good quality. Some supplies are, however, now being drawn from other regions. The tree grows rapidly and may attain a diameter of from 24 to 30 inches in 5 to 6 years.

Balsa trees grow principally along streams, which provide means of transportation for the logs. Native labor is generally employed for felling the trees and hauling the logs to the water. After the most readily available timber is cut, the cutters must go farther and farther upstream and farther back from the streams. Where there is sufficient water, the logs are made up into rafts that are tied together into trains. Steering sweeps are mounted fore and aft so that the sharp bends of the rivers can be negotiated.

Sawmills are usually located near the mouths of the rivers in order that the lumber may be loaded directly on shipboard. As balsa is susceptible to decay, the lumber should be thoroughly dried before shipment.

URUGUAY

Land

Uruguay, roughly quadrangular in shape, covers an area of some 72,000 square miles, being the smallest of the South American republics. It is about the size of North Dakota; and of its 1,150 miles of border, about half is shoreline, on the ocean, rivers, or lakes. About 92 percent of its usable land is given over to the raising of livestock, only 7 percent being devoted to farm crops. The land is gently rolling, there being no high mountains.

Climate

Uruguay lies within the southern Temperate Zone, its summer arriving in January and its winter in June and July. The climate is among the most pleasant in the world, the temperature in winter averaging about 50° F., and in summer, 74°. There is enough rainfall to water the land adequately, but sunny weather prevails for about two-thirds of the year.

Population

The population in 1940 was estimated to be around 2,123,000, of which about one-third is concentrated in Montevideo, the capital. The Indians disappeared many years ago, and the people are almost completely of European descent. The Uruguayan standard of living is relatively high, with the result that the cost of living has acted somewhat as a deterrent to travelers and immigrants from other countries.

Agriculture

The most important occupation in Uruguay is stock raising—mainly of sheep, cattle, and hogs. Wool is the principal export, followed by meats, frozen and canned, and hides. Other exports are linseed and wheat. Livestock production is spread fairly uniformly over the entire country, although the Departments of the center, west, and northwest probably have slightly larger numbers than the others. Uruguay as a whole provides ideal grazing territory. Furthermore, the raising of livestock is the most efficient use of land in countries with a low density of population. These two factors account for the small proportion of land devoted to other agricultural pursuits.

Wheat and flax are grown in the southwest, principally in the Departments of Soriano, Colonia, San José, and Flores. In Colonia, also, the production of oats is important. Corn is raised toward the southeast, in Canelones and Lavalleja. Viniculture is confined almost exclusively to the small Department of Montevideo, several good domestic wines being produced there. Climate and soils almost everywhere are favorable for the growing of oranges and other citrus fruits, but production is concentrated in the north and the northeast. Because the soil seems to be equally fertile in all parts of the country, and because of the regularity of the climate, some produce is raised in all Departments. About 45 percent of the farmers own their farms.

Uruguay's principal imports are manufactured articles, petroleum products, coal, sugar, and textiles. The economic policy of the country is guided by the Government under a system of price control and of regulation of imports and exports. Indicative of the importance of foreign trade is the fact that customs duties make up a large proportion of the government revenues.

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IN THIS ISSUE

September 1943

NAMES & NEWS

Colombia to have Congress of Cooperatives

Colombia's first National Congress of Cooperatives is to be opened in Medellín on September 15, 1943. Some 28 delegates will attend, two from each Department of the country, one to represent the consumers, the other, the producers. Only the 28 delegates will have the right to vote, although other special delegations may be sent to the Congress. Special guests are also expected. Those to be invited include the President of the Republic; the Ministers of Economy, Finance, Labor, and Public Works; the superintendent of cooperatives; and representatives of the Caja de Crédito Agrario, the Banco de la República, the National Cooperative Fund, Banco Agrícola Hipoticario, and the Sociedad Colombiana de Agricultores.

Nicaraguan Rubber Investigations Extended

An agreement between the United States and Nicaragua was effected late in June whereby plantation rubber investigations were extended from June 30, 1943, until 6 months from the date of a notice of termination given by either Government. The original agreement under which the investigations were undertaken was signed on January 11, 1941, by the Nicaraguan Minister of Agriculture and Labor and the Acting Chief of the United States Bureau of Plant Industry.

Monsieur S. Roger Victor, a student from Port-au-Prince, Haiti, who has been studying agriculture at the University of New Mexico, was a recent visitor to Washington. Monsieur Victor, who was given a scholarship by the Government of Haiti in order to study the latest methods of dairy research in the United States, plans to continue his studies at Rutgers University.

Dr. Marcos Augusto Enrietti, Brazilian agronomist and Director of the Instituto de Biología e Pesquisas Tecnológicas at Curitiba, was in Washington until late in July. He planned to visit various technical institutions, irrigation projects, experimental farms, and the principal agricultural sections of the country before his return to Brazil.

Ralph H. Allee of the Office of Foreign Agricultural Relations left Washington, D. C., on July 15 for a trip to El Salvador, Nicaragua, Peru, and Ecuador. He will assist the cooperative agricultural research and extension stations in these countries in preparing their projects for the year 1943–44.

Mr. Claud L. Horn of the Office of Foreign Agricultural Relations left Miami on July 17 for Bolivia. While in that country he will help select a site for the cooperative agricultural experiment station to be established under an agreement signed April 6, 1943, by representatives of the Bolivian Ministry of Agriculture, the United States Department of Agriculture, and the Bolivian Development Corporation.

Dr. Julian C. Crane has been appointed to serve on a fiber-investigations mission in Cuba at the Agricultural Experiment Station of Santiago de las Vegas, not far from Havana. Dr. Crane, who completed his graduate and postgraduate work in horticulture and botany at the University of Maryland, will work with Dr. Julian Acuña, Cuban botanist, on roselle, sansevieria, henequen, and other fibers.

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For More and Better Dairy Products

With food production becoming an increasingly important wartime problem throughout the Western Hemisphere, dairy products are receiving new emphasis because of their high nutritive value. The dairy industry must face the challenge of wartime demand—a giant worthy of a supreme effort.

by O. E. REED

Of all the American republics, the United States has the highest per capita consumption of dairy products. With strong demands made on the dairy industry to supply not only home needs but the needs of overseas military forces and the import requirements of the United Nations, it must look carefully into the question of both quantitative and qualitative production. A discussion of the ways and means by which the objective may be approached should interest all the other Americas, whose dairy industries will likewise be reviewed in the near future.

In normal times the dairy industry of the United States usually has the problem of finding a profitable market for increasing quantities of milk each year. Today the problem is one of producing all the milk and other products the wartime market demands.

Even with the supply-and-demand situation reversed by war conditions, the dairy industry is, however, still confronted with the same two fundamental problems that have long handicapped its economic advancement. One is the problem of increasing the average producing capacity of all dairy cows, and the other is the problem of improving the average quality of all milk sold from the farm, either for fluid use or for manufacturing purposes.

In the individual herd the average production per cow may be raised by better feeding practices, by culling the low-producing cows, and by the use of sires that are genetically better than the females in the herd. All three of these methods of herd improvement call for the use of records. And for constructive breeding, production records are the only guide to locating the superior germ plasm which is so essential for improving the producing ability of the future members of the herd.

Dairy herd-improvement associations, or milk-recording societies, have been part of the dairy program in the United States since 1906, and thousands of records have been analyzed. One-third of the cows in these herds have not produced enough milk to pay for their keep, but few owners have realized this fact until they joined a testing association and used production records to weed out the boarder cows.

The showing made by association herds indicated that something was wrong with the breeding program in general use; so further study of these records was undertaken to seek the causes for the high percentage of

A proved Jersey bull of the research center at Beltsville, Md., United States Department of Agriculture.

failures. This additional study was planned for the purpose of analyzing the transmitting ability of the herd sires by comparing the production of the daughters with that of their dams. The figures revealed that about half the bulls used in these herds had sired daughters that averaged less than their dams.

Since good sires are the key to herd improvement through breeding, the quality of the sires should be determined in advance. This is the practice followed with the experimental breeding herds of the United States Bureau of Dairy Industry. The method of using only proved sires has been in use in these herds for over 20 years, and they have made a steady increase in the level of production, without the benefit of selection or change in feeding methods. In addition, a large majority of the young bulls born in these herds have already proved their ability to increase production in the herds of cooperating dairymen.

There is always a shortage of good proved bulls, so some means must be found for conserving the good germ plasm and making greater use of it. An increase in the volume of record keeping would help to prove more bulls, and the usefulness of the outstanding bulls could be greatly expanded by means of artificial insemination. Where conditions are favorable, each good bull could be used to impregnate artificially a thousand or more cows in a year. Around 100 artificial breeding rings have already been established in the dairy sections of the United States.

U. S. D. A Photograph by Forsythe.

Lady Burke Ormsby Gerben Cola Ollie, 3-year-old champion milk producer with one of her daughters, who are part of the experimental herd of the United States Bureau of Dairy Industry.

Certain fundamental steps are necessary to make such a breeding program possible. There should be, first, widespread use of cow testing and record keeping to get a measure of production and a means of proving bulls; second, the use of sound feeding methods to encourage economical production; third, the adoption of health programs for herds to keep the animals sound and to avoid the spread of disease from herd to herd. The last is essential, as many diseases impair the milk-producing ability of the cows in the herd and even destroy their usefulness as dairy animals.

Disease control is of great importance in the dairy herd in still another way. Some infectious diseases of cattle may be transmitted to man by means of the milk; and this brings up the second problem mentioned—the sanitary production of dairy products.

In all educational and research programs undertaken to promote the economic interests of the dairy industry, three main factors must be considered: (1) Quantity of milk produced; (2) quality of the milk and of the products made from it; (3) disposal of the products.

Milk must be produced in quantity economically, and it must be of high quality. These two essentials must be satisfied if the program is to be rounded out by accomplishing the third objective—the greater use of dairy products in the diet. Efforts to encourage a greater consumption of dairy products are useless unless sufficient quantities are available at reasonable prices and unless, from the standpoint of the quality, the milk is safe and pleasing in flavor. Of what use is quantity production of milk if it reaches the market unfit for sale or makes low-grade products that either spoil or are too unappetizing to find a ready market? The loss to the dairy industry because of low-grade products is severe.

In general one recognizes that lowering the cost of milk production through better feeding, breeding, and other methods is one way to increase the farmer's income. Efforts to improve the quality of dairy products, however, are apt to be looked upon as a less tangible means of increasing income. Nevertheless, good-quality products are necessary if new consumers are to be gained or the old ones retained. The production of low-quality milk has an adverse effect on the pocketbook of both the producer and the manufacturer.

The payment of premiums to dairy farmers for milk and cream on the basis of its grade is perhaps the most logical and effective means of raising the general level of quality. The common practice of the buyers in the past has been to accept all milk and cream offered and to pay

U. S. D. A. Photograph by Forsythe.

Unloading milk from refrigerated cars at a processing plant.

almost as much for products of lower grade as for those of higher grade. Such a practice does not encourage the farmer to improve his product.

Sometimes the manufacturer or distributor contends that he cannot afford to pay the farmers more for milk unless he in turn receives more for the products he markets. This contention is not necessarily true. Many prosperous, leading dairy concerns have built up a gratifying volume of business by paying strict attention to quality and paying a premium for good-quality raw material. In the long run processors and distributors who handle high-quality products obtain the bulk of the trade, and competitors sooner or later find out that they cannot continue in business.

The question of profits should not be the only determining factor—the health and happiness of human beings should also be considered. There are abundant statistics to show the relation of unclean milk to infant morbidity and mortality and the deleterious effects of such milk on general health. These effects are not entirely divorced from economics, for human welfare cannot be relegated to the background when the economic welfare of a nation is considered. Each life lost and each day of sickness mean a loss of earning power or potential usefulness to the family and the state. How then may the improvement needed for higher quality be achieved? There are three general ways in which this can be done:

First, the payment of premiums for increased care in milk production. This has already been mentioned.

Second, the use of the police powers of the national and local governments. This method has certain drawbacks. Difficulty is encountered sometimes in providing sufficient personnel to make inspections and analyses frequently enough to accomplish the desired results. Logically, this method in operation is aimed at the worst offenders, and the police power is exercised at indefinite intervals, usually too far apart to produce lasting good.

Third, education. This may be accomplished by means of literature, instruction in schools and colleges, demonstration farms and areas, and demonstration work with groups of producers, and even with individual producers. The educational method of improving the quality of dairy products is perhaps more difficult and is usually slower than others, but the results are more lasting, because it explains reasons and stimulates voluntary cooperation. A person who understands the reasons for performing certain operations is likely to perform them regularly, until they finally become a habit.

The production of high-quality dairy products is not difficult. There are many refinements that may be desirable in advanced stages of dairy sanitation, but by and large the general principles of clean milk production are well known and universally applicable. Of course there are some local variations brought about by extreme climatic conditions and the availability of labor and supplies, but very generally the fundamental practices that are good in one section are equally good in another. The dairyman may require some additional equipment for the production of milk of high sanitary quality, but he can solve most of the problem by diligence and care in attaining and maintaining the utmost cleanliness.

The problem must be made simple for the producers, and it must be explained to them in simple language, especially in areas where dairying is new or where advancement has been somewhat slow. There are a few vital elements, such as clean, healthy cows; clean

U. S. D. A. Photograph by Knell

In pasteurizing milk, it is piped from big storage tanks to these vats, where it is held for half an hour at a temperature of 145° F. This kills any disease-producing bacteria that might be in the milk.

healthy milkers and milk handlers; clean milk utensils; and proper cooling, cold storage, and transportation of the milk or cream. If the educational program results in farmers observing these four general rules, most of the goal will be attained. This can be brought about only by concerted, systematic, and uniform effort, coupled with vast patience and understanding by educational workers.

One of the primary considerations in the dairy industry is the health of the cattle. This is economically important, because diseased cattle may die or they may be so affected that their milk production falls to a point where they are unprofitable producers. Of even greater importance, however, is the effect on the health of the human population that must use the milk from these cattle. Rigid methods should be adopted to stamp out all animal diseases but especially those that are dangerous to human health, such as tuberculosis and brucellosis.

The health of milk handlers must also be kept under constant supervision to prevent the spread of disease through milk with which they come in contact.

Other factors that minimize the spread of dangerous organisms by milk are the maintenance of pure water supplies on dairy farms and in dairy establishments and the proper disposal of sewage and body wastes.

There are other sources of bacterial contamination. They may not contribute directly to the impairment of human health, but they are nevertheless important from an economic standpoint. Usually by far the greatest number of bacteria found in *fresh* milk are contributed by unclean utensils, especially milk pails and strainers. These utensils must be kept scrupulously clean by careful washing and subsequent sterilizing treatment with boiling water, steam, or an effective chlorine disinfectant. Probably most of the bacteria found in milk as it arrives *at the market* are the result of improper cooling and cold storage. If the milk remains warm, bacteria multiply rapidly, and the milk soon becomes unfit for consumption. Efforts should be made to increase the amount and efficiency of refrigerating facilities all the way from the farm to the consumer and to speed up transportation so that milk will not be too long en route.

Time out for a bottle of milk is a recognized part of the health program of many schools.

One of the final steps in the preparation of milk or other dairy products for the consumer is pasteurization. The proper heat treatment of milk, or pasteurization, has practically no disadvantages. On the other hand, pasteurization lengthens the keeping quality of milk and makes it safe for consumption. Proper pasteurization of milk kills all known disease-producing organisms commonly found in milk. It should not, however, be used as a cloak for careless methods of production and handling.

Milk is naturally one of the most efficient, wholesome, and palatable foods. Much depends upon human effort in preserving these qualities. Prominent nutritionists have stated that at least 20 percent of the food dollar should be spent for dairy products. In many sections that goal is far from being reached. Not only should the military forces be supplied with an adequate diet containing dairy products, but equally important is the need to see that all men, women, and children in the civilian population have equal opportunities for nutrition.

First of all, the public must be educated as to the nutritive and economic values of dairy products. This can be done in a number of ways. In the United States of America much of this work is done through the National Dairy Council, which, through attractive posters, educational programs in the schools, radio talks, and advertisements, seeks to inform the general public as to the dietary benefits of milk products. This institution is supported by funds subscribed by the various branches of the dairy industry. To complete a proper program dairy products must be made available in sufficient quantities at reasonable prices, and, above all, their quality must be made so good that no consumer will find them unpalatable.

There are certain groups at low-income levels, however, for whom some provision must be made beyond their ability to purchase at the normal market prices. Dairy products may be furnished to low-income groups, free of cost or at a reduced cost, by voluntary contributions or by State subsidies. Milk is being distributed to such classes of people in the United States largely through schools and welfare centers. The nutritional aspects of this subject have not been discussed, but one should remember that a well-nourished and healthy population depends to a large extent upon the dairy products in the diet.

Peru—Ancient and Modern

In forging ahead as a modern nation, Peru is carrying out its traditional pattern of action. Peruvian civilization was outstanding in pre-Columbian America. A rich Spanish-Colonial culture, added to this heritage, has equipped Peru with the energy and intellect to play an effective role among nations.

by PHILIP LEONARD GREEN

Peru is a country with a background that spans many centuries. When Spain's conquering warriors first saw Peruvian shores, the land could already boast of "previous" civilizations. One of these, at Chan Chan (near the modern city of Trujillo), is said to have lasted from about 900 to 1300 A. D. Peruvian archeologists, notable among them being Dr. Julio Tello, have unearthed such finds as mummies wrapped in *mantas* made of tapestry.

The land of the Incas, which the Spaniards found, is said to have supported about 10,000,000 people. The walls of some Inca cities still stand. Inca bridges are

Pan American Airways Photo

Ruins of early Indian civilization at Machu Picchu, Peru.

still being used. The Inca-ruled peoples were the first known to have practiced terraced agriculture; to this day, their descendants, who make up the bulk of Peru's population, follow the farming methods of their ancestors.

When the Spaniards ruled in America, Peru was the administrative and cultural center for all their South American realm. Lima, the capital, which was founded on January 18, 1535, was known as the "City of the Kings." To this day, though many modern improvements have been adopted, Lima, with its beautiful churches, homes, and priceless art collections, still exudes an atmosphere of Spanish colonial glory.

There are really three Perus, geographically speaking. First, there is coastal Peru, where one-fifth of the people live. About 50 rivers lace across this strip, some never reaching the Pacific Ocean. Agriculture and life exist only along the shores of these rivers. Second, there is the *sierra* or mountain region. Here live three-quarters of the nation's people. Lastly, there is the *montaña*, or tropical forest region, east of the *sierra*, but occupying the same place in Peruvian aspirations as did the Old West of the United States. In this region, we find some of Peru's important rivers flowing northward, thence eastward—the Huallaga, Marañón, and Ucayali.

Courtesy of Peruvian Embassy.

A bridge on the Central Highway.

Panagra Photo.

Old and new transportation—llamas and airplanes.

Peru is more than three times as large as California. With about 501,400 square miles of territory, exclusive of Lake Titicaca, it is fourth in size among the South American republics. A 1,400-mile coast line, washed by the cold Humboldt current, gives the country a much cooler climate than its latitude would indicate. Peru is also a land of varied scenic beauty and awe-inspiring natural wonders. Mount Misti, for instance, rises to the majestic height of 19,000 feet.

Of the 7,133,000 people who live in Peru, over 52 percent are of European and mestizo background, 45 percent pure Indians, and the rest are Negroes and Asiatics. Among those who have immigrated to Peru are about 1,900 Germans, 3,900 Italians, and 20,000 Japanese.

From earliest times, Peru has had British and German immigrants. One of the Presidents of the country was a Billinghurst; and the name of Gildemeister is widely known in the field of trade.

One frequently hears in Peru that the Government lives from the mines but the people live from the soil. About 4,500,000 acres of Peruvian soil are given over to farming, according to available estimates, but even so, farm land represents only about one-seventh of the arable area. Of course, some of the noncultivated land is given over to pastures for sheep and cattle breeding. About one-half of the crops come from land that is irrigated.

There is a wide variety in Peru's farm products. In the valleys of the coastal region, cotton and sugar are grown. The *sierra* produces such Temperate Zone crops as barley, corn, oats, potatoes, and wheat. In the *montaña* regions may be found sugar, coffee, tobacco, barbasco, rubber, hardwoods, and, in small

Courtesy of Peruvian Ministry of Foreign Relations.

Grain growing high above sea level.

quantities, cinchona. Peru produces about 450,000 tons of sugar yearly.

Peru ordinarily supplies its own requirements of meat, having about 11,000,000 sheep and 2,000,000 cattle, as well as a hog-raising industry.

In the Tarma Valley, where land sells for about $150 an acre, four crops of alfalfa may be grown in one year.

The islands along the coast of Peru were for many years the source of *guano*, a fertilizer formed by the deposits of pelicans and related bird species. Large exports of this product have gone to enrich the fields of many countries, and large quantities have been used domestically by the Peruvian farmers before and since the Spanish conquest.

Other sources of wealth are the copper mines and smelters at Oroya and Cerro de Pasco and the oil deposits near Talara. The latter are located in the northern coastal region, from the southern border of Ecuador for about 280 miles south and inland for a distance of from 18 to 55 miles. The annual output of oil from this region totals about 17,500,000 barrels. There have also been some oil developments at Pochitas. Gold mining is carried on in the Arequipa region.

Peru has a number of national industries worthy of note. First, there are the cotton factories, largely in the hands of Peruvians. Peru also manufactures chemical products, glassware, prepared foods, textiles, paper, beer, and shoes and has sugar mills as well. Then, of course, pottery and blankets are made by the natives.

Peru figures in world trade through a number of important commodities, and the value of total exports exceeds that of total imports. Mineral products account for two-thirds of the exports. Petroleum shipments are also important, averaging more than 10,000,000 barrels a year. Peru follows Mexico and Chile only in the volume of copper exported and supplies one-third of the world's consumption of vanadium, silver, antimony, and manganese. Nickel and tungsten also are included among the items exported.

Of the agricultural commodities exported, cotton normally takes first place, accounting for 18 percent of all exports, and sugar follows with 9 percent. Peru exports some wool. Rotenone-bearing roots, fibers, and flax also figure importantly.

Machinery, vehicles, instruments and tools, foodstuffs, chemicals, and pharmaceuticals make up the bulk of Peru's requirements from abroad.

In view of the mountainous nature of the country, transportation has always been an important problem.

As early as 1870, one Henry Meiggs from the United States started building a line to link the coastal and interior regions. He had to overcome almost insurmountable problems. The outcome was what is today the highest standard-gage railroad in the world.

A patio of the University of San Marcos, Peru.

In 1936, Peru undertook a 3-year, road-building program costing $8,750,000. One may now go by truck, bus, or automobile from Lima beyond Tingo María on the eastern slope of the Andes.

Peru's section of the Pan American Highway is almost finished. Not only will this bring the country closer to its neighbors, but it will also aid materially in tightening the bonds between various parts of the republic itself.

Convenient landing facilities for ocean-going steamers coming to Peru were notably lacking until October 24, 1934, when the construction of a new dock was undertaken at Callao, the port for Lima. The dock itself is over one-third of a mile long, and the breakwater is 2 miles long. The dock cost over $16,000,000, and an additional sum of $2,500,000 was spent on other facilities.

In air travel, Peru has also made considerable progress. Machinery can now be flown to the eastern foothills of the Andes in 30 minutes, whereas formerly 3 weeks were required for its delivery over the same distance.

The Limatambo airport near Lima compares favorably with the best in the United States. Peru, too, has one of the best air forces in South America.

Aside from material progress, Peru can point to numerous social advances made within recent years. With about 20,000 workers in mines, 25,000 in sugar fields, and more than 25,000 in road building, not to mention those engaged in other pursuits, Peru has instituted obligatory social insurance; workers' hospitals, clinics, and recreational facilities; workers' housing, as well as the famous popular restaurants.

Peru is one of the most interesting countries in the Western Hemisphere. It was built upon an advanced aboriginal civilization, nurtured by a Spanish colonial culture, and has a tradition of intellectual achievement, which is typified by the University of San Marcos, founded in 1551 (85 years before Harvard). Today Peru stands among the progressive nations of modern times.

H. Hinrichs Photo.

Plaza Dos de Mayo, Lima.

The Americas Look to Their Rice Fields

With supplies from the East cut off, rice culture in the Western Hemisphere becomes increasingly important. Several countries have recently expanded their production to meet hemisphere needs.

by JENKIN W. JONES

Rice is the principal food crop grown in the subtropical and tropical countries of Asia. Outside the Orient, the main rice-producing countries are Italy, Spain, Egypt, the United States, and Brazil. Rice was introduced into Peru and other Spanish American areas during the early colonial period of the Western Hemisphere. The exact date of introduction is not known, but reports indicate that rice was grown in Peru and Brazil long before it was introduced into the Carolinas in the seventeenth century. Rice is now grown in nearly all countries in the Americas in temperate, subtropical, and tropical climates. The ten leading Western Hemisphere countries in production are Brazil, the United States, Mexico, Ecuador, Peru, Colombia, British Guiana, Chile, Argentina, and Dutch Guiana (Surinam).

Normally, these countries, except Brazil, the United States, British Guiana, Mexico, and recently Chile and Ecuador, do not produce sufficient rice to meet home needs. Prior to World War II, considerable rice was imported from the surplus-producing countries of Southeastern Asia, namely, Burma, Thailand, and French Indochina. Since supplies from these countries are no longer available, production has been increased materially in the Americas, especially in Brazil and the United States. The surplus of these, and other American countries, appears to be more than sufficient to meet present needs in the Western Hemisphere. During 1937–39, the total American rice acreage averaged about 4.3 million acres, and production approximated 150 million bushels a year.

Brazil and the United States are the main rice-producing countries in the Americas. Production in Brazil from 1937–38 to 1939–40 averaged about 71 million bushels and in the United States during the comparable period, 54 million bushels. Colombia produced an average of around 6 million bushels, followed by Mexico and Ecuador with 4 million bushels each. Sharp increases have been reported for more recent years in several countries, notably the United States, but complete statistics are not available for all the Americas. British Guiana usually exports rice, and Chile has a surplus in some years. Brazil and the United States are so located that their surplus can be readily moved to neighboring deficit countries.

Methods of Production

In the Western Hemisphere, rice is grown on relatively level land located largely in river basins and on coastal deltas and prairies. Such areas usually have a readily available and dependable supply of fresh water for irrigation and soils that hold water well but yet can be adequately drained for seedbed preparation, seeding, and harvesting operations.

Many different production methods are employed in the Western Hemisphere, as a result of the great variations of climate and agricultural developments. The practices range from the extensive mechanized methods of the United States, Brazil, and elsewhere, to hand culture in the Guianas and other countries of more intensive agriculture.

In the United States, the levees are constructed, the seedbeds prepared, and the crop is sown and harvested

Rice fields in the State of Morelos, Mexico, where the predominant system is to sow in seedbeds and transplant by hand to small irregular terraces.

with farm machinery. In California, the seed is largely sown broadcast on submerged land by airplanes, and the crop is mostly harvested with combines and dried artificially. In British and Dutch Guiana, on the other hand, the methods of the Orient are followed. The seed is sown in beds, and when the seedlings are from 4 to 6 weeks old, they are pulled up and transplanted in the fields by hand. The crop is harvested with hand sickles and threshed by flailing, treading on prepared floors, or with small threshers. These methods are used to some extent in parts of Brazil, Mexico, Ecuador, Chile, and Peru.

Based on cultural practices, all varieties of cultivated rice may be grouped roughly into lowland and upland types. Upland (nonirrigated) varieties normally are grown in cultivated rows where rainfall is abundant but not sufficient to submerge the land. Lowland varieties are grown on land that is kept submerged from 2 to 8 inches deep by irrigation or rainfall during the greater part of the growing season. The terms "upland" and "lowland," as used above, have no reference to altitude. Upland rice is grown largely for home use.

Spikelet, seed, and kernel of (reading from top to bottom row) Caloro, short-grain rice; Blue Rose, medium-grain; Fortuna, long-grain; and Rexoro, long, slender-grain rice.

Based on the nature of the starch deposited in the seeds, rice varieties are grouped into common, or nonglutinous, and glutinous, or waxy. The common varieties are more important, but considerable glutinous rice is produced in the Orient, where it is used largely for the making of pastries and candylike confections. Glutinous rice is not grown to any extent in the Americas.

Based on grain length and shape, varieties often are grouped as short-, medium-, long-, and long-slender-grain types, of early, midseason, and late maturity. Rice varieties may require from 90 to over 210 days from seeding to maturity. Some of them mature in a fairly constant number of days, regardless of seeding date; whereas others that are more sensitive to short-day length tend to mature in a shorter period as seeding is delayed. The period from seeding to maturity often is shortened by 30 to 60 days or more by seeding such varieties late in the spring. Yields usually are reduced by late seeding. Many varieties from the Tropics fail to head and mature before frost when grown in temperate regions, owing to the relatively long fall days; whereas late varieties from temperate regions usually head and mature early when grown in the Tropics, owing to the comparatively short days.

In appearance, the kernels of common rice may appear translucent, semitranslucent, partially opaque, or almost entirely opaque after the hulls are removed. They may be hard, semihard, or soft, and the bran coat on unmilled kernels may be light brown, brown, amber, red, reddish-purple, or purple in color. As a rule, however, only those varieties having brown kernels are grown commercially, and when the hulls are removed the product is known as brown rice.

Varieties differ strikingly in culinary properties, such as the appearance, texture, taste, and flavor of the boiled rice, and in the time required for cooking, the amount of water absorbed, and the expansion of the kernels. These quality factors are difficult to appraise accurately, owing to differences in the preference of consumers and experts. Consequently, the type of rice preferred by consumers differs within a country as well as between countries. When properly cooked by boiling, the kernels may retain their shape, and be either tender and flaky or firm and slightly sticky; otherwise they may lose their shape and be pasty and unattractive. When milled to the same extent, however, the nutritive value is essentially the same.

Adaptation

As a rule, only varieties that enter into export markets, or those that possess some unusual characteristics, are known outside of the countries of production. All the

varieties grown in the Americas were apparently originally introduced from Asia through Europe or Africa, or were selected from introductions obtained from these continents, or elsewhere. In Argentina, Chile, Brazil, Peru, and Uruguay, the short-grain varieties grown probably came from Spain, Italy, and Egypt. In British Guiana the varieties used probably came from India and Ceylon and in Dutch Guiana, from the Netherlands East Indies. The varieties now grown in the United States were selected from introductions from Japan, Taiwan, the Philippine Islands, and from natural crosses. Whether the varieties cultivated in any particular country may also be adapted to conditions in other countries can be determined only by actual field tests.

The sensitiveness of varieties to environmental conditions should be borne in mind when seed is brought in from other sections or countries. The numerous native rices grown in Asiatic countries were no doubt selected and saved because they were well-adapted to local conditions and methods of production. Many of these varieties are, however, of limited value or even worthless when transferred to regions with different environments.

For example, Blue Rose is well-adapted to and extensively grown in Arkansas, Louisiana, and Texas; but it seldom matures in the Sacramento Valley of California, where wide daily ranges in temperature and a relatively short growing season prevail. Blue Rose is not grown commercially in the Tropics, because under short-day conditions it does not tiller well, heads too early, and produces low yields.

The lowland varieties grown commercially in the Americas include short-, medium-, long-, and long-slender-grain types of early, midseason, and late maturity. Usually, the short- and medium-grain varieties, due to the shape of the kernels, mill better than the long- and long-slender-grain types and often are grown extensively, because they are the most profitable from the standpoint of both growers and millers.

The principal commercial rices grown in the Americas include: In the United States, the short-grain Colusa, Caloro, and Acadia, the medium-grain Early Prolific,

Panicles, seeds, and kernels of rice; Blue Rose (on the left) and Early Blue Rose (on the right) varieties.

In parts of Mexico and other Latin American countries rice is harvested by hand.

Zenith, and Blue Rose varieties that usually retain their shape and when cooked properly are rather firm and slightly sticky, and the long-grain Rexoro, Fortuna, Nira, and Edith varieties that are when cooked properly usually tender and flaky; in Brazil, short-grain rices that probably came from Italy and Spain, the medium-grain Blue Rose and Santa Maria, and the long-grain Fortuna, Agulha, and Edith varieties; in Argentina, short-grain rices and Blue Rose, Fortuna, and Agulha; in British Guiana, the long-grain Demerara Creole, Blue Stick, and No. 79 varieties; in Dutch Guiana, the long-grain Skirvimankoti and Kretek; in Ecuador, Canilla and Fortuna; and in Mexico, Edith.

None of the varieties from Central and South America that have been tested have proved to be so well suited to the United States as the varieties now grown. Of the varieties grown in the United States, Fortuna appears to be well-adapted for growing in Central America, Cuba, Colombia, Ecuador and apparently also in parts of Brazil, Argentina, and Chile. Blue Rose grows well in southeastern Brazil, parts of Argentina, and is the leading commercial variety produced in the Americas. It is extensively grown in the United States and in the main surplus-producing State of Rio Grande do Sul in Brazil. Blue Rose does not thrive in British Guiana and Dutch Guiana, for in these countries it matures early and produces low yields. Rexoro appears to do well in Cuba, but in the Guianas, it is less productive than the principal commercial varieties grown. For example, in a yield test in Dutch Guiana, based on the yield of Skirvimankoti, the main variety, as 100 percent, Kretek gave 102, Rexoro 89, Early Prolific 39, and Blue Rose 33 percent, respectively.

Late-maturing and midseason, medium- and long-grain varieties usually are grown in the Tropics. At the higher elevations of the Tropics, however, the climate may be subtropical or temperate, and under such conditions adapted short-grain varieties may also be grown. The short-grain early and midseason varieties, such as Chinese Originario, Nero Vialone, and Maratelli from Italy; Benlloch, Bomba, Amonquili, and E. A. S. No. 3 from Spain; Yabani, Sabeini, Sultani, and Agami from Egypt; and Colusa (1600) and Onsen from California, under favorable conditions, are productive and well-adapted for growing in most temperate climates. In the rice trade of this continent these and later maturing varieties of the same type, such as Caloro, Acadia and Asahi, are referred to as Japanese rice (now Pearl in the United States). The short-grain early maturing varieties also can be grown in the subtropical climates, but under such conditions they are usually less productive than late varieties of the same type.

A simple method of threshing is employed.

Scientific Agricultural Education Advances in Brazil

Brazil's expanding program of education is of interest to all Americans. Often, however, Brazilian schools, and departments within schools, progress against great odds with respect to budget, equipment, libraries, and trained personnel.

by F. G. BRIEGER

The Department of Cytology and General Genetics in the Luiz de Queiroz School of Agriculture at Piracicaba, State of São Paulo, has made progress in teaching and agricultural research despite its handicaps. The Department was created in 1935; but work was not actually organized until 1936, when the writer was named head of the Department. The school, a branch of the University of São Paulo, has 19 departments, each of them headed by a full professor with one or more assistants. Teaching is of course the main objective of the staff, but professors are at liberty to select problems of a scientific nature for research. In the Department of Cytology and General Genetics, such work is obligatory.

When first organized, the Cyto-genetics Department consisted of the writer, his assistant, Dr. E. A. Graner, and a laboratory helper. Within the past 6 years, two more assistants have been added to the staff. With the exception of the first assistant, the members of the staff are under contract, with incomes derived in part from the School itself, in part from other institutions, and mainly from the Instituto Agronômico at Campinas.

Naturally, the first task of the Department after its inception consisted of the organization of teaching. In the second year of their 4 years' course students take genetics—3 hours of lecture and 4 hours of laboratory work per week. The lectures fall under three headings: Probability, calculus, and the elements of statistical analysis, with reference to agricultural field technique in general and genetics in particular; cytology, with some lectures on embryology and gametogenesis; and general genetics, with some lectures on applied genetics and plant and animal breeding.

Laboratory work accompanies the lectures as closely as possible. The analysis of qualitative variation is carried out using genetic material. In cytology, the following problems are studied: Mitosis—changes that take place in the process of cell-division; meiosis (or miosis), the process resulting in a reduction by half of the number of nuclear chromosomes; chain formation; and determination of somatic chromosome numbers in cultivated plants. Students also learn pollinization, seed collecting, methods of recording, and allied subjects by experiments with cultivated plants.

There is no lack of material for lectures or laboratory work, even in winter, owing to the climatic conditions at Piracicaba. The course, however, is overcrowded for the limited staff, and another difficulty is found in the lack of adequate textual material in Portuguese.

There are opportunities for postgraduate work, although the need for agronomists is so great that most students find employment immediately upon graduation and so do not remain at the school for the additional year or so. Special courses are occasionally offered, such as a 2-week intensive course in cyto-genetics in 1937 and another in statistics and field technique in 1938.

Research Limited to Plants

The authorities recognized from the beginning that experimental work could be carried out only on a limited scale, mainly because of lack of time, space, and trained personnel. Such research had to be limited to plants, in the absence of any equipment for work on insects, birds, or small animals; although the staff admit regretfully that they are aware of tempting problems in, say, an analysis of the wild guinea pig or of variability and mimicry in native butterflies.

A useful greenhouse has been constructed. It is especially adapted to subtropical climatic conditions, with sufficient ventilation in the hot summer and protection in winter. Plants can be cultivated in it in ordinary pots only if these can be submerged in moist sand; otherwise, iron pots must be used. A study is being made of the substitution of water cultures for the ordinary method of pot cultivation. For cultivation during the dry winter months, well-drained, cemented beds were built, all of standardized dimensions, which permit of shading and easy irrigation. All soil used in beds or pots is sterilized by steam.

The laboratories are well equipped for cytological work, for microphotography and macrophotography, and also, to a limited extent, for physiological studies.

All work is done with the close cooperation of the whole staff, although, for the sake of training, certain problems are allotted to each assistant. Each assistant also has one plant of economic importance under study. During the summer months, the attention of the staff is devoted especially to corn and tobacco; in the winter, time is devoted to ornamental flowering plants, vegetables, and certain cereals. Attention is also given to wild representatives of some cultivated plants or to strains cultivated by the Indians, especially corn, tobacco, manioc, and papaya. Colleagues in other countries often contribute information and samples.

Another important feature of the work of the Department of Cytology and General Genetics is its cooperation with other government institutions. Thus, it is in close contact with the work being carried out at the Instituto Agronômico at Campinas and the extension work being done by the Fomento Agrícola (Agricultural Development) in the City of São Paulo. Recently liaison was established with the Instituto de Experimentação Agrícola (Institute of Agricultural Experimentation) of the Federal Ministry of Agriculture at Rio de Janeiro, and with its network of experiment stations all over Brazil.

Library facilities are as yet somewhat limited, as the Department of Cytology and General Genetics must share books, space, and purchases with the other departments of the school. For this reason the Department invites the donation of reprints and books.

Neither the general organization nor the work of the Cyto-genetic Department is substantially different from those of similar institutions; but the advances that have been made by this Department since 1936 are extremely interesting.

Reading ABOUT THE AMERICAS

Inter-Americana. Studies II. Man and Resources in the Middle Rio Grande Valley, by Allan G. Harper, Andrew R. Cordova, and Kalervo Oberg. 156 pp., illus.; School of Inter-American Affairs, University of New Mexico, Albuquerque, 1943. An analysis of the origins and development of present-day social, economic, and physical resources of an area which extends from the Elephant Butte Reservation to the Colorado-New Mexico state line. The Valley contains the only distinctly tricultural society in the United States composed of Anglo, Indian, and Spanish elements. Since two of the ethnic groups—Indian and Spanish—are dominant in many of the other American republics, the problems of the Valley should be of interest to readers south as well as north of the Rio Grande. Following the index are 20 interesting plates and biographical notes about the authors.

My Land and Your Land Conservation Series: 1, *Would You Like to Have Lived When—*, 32 pp., illus.; 2, *Raindrops and Muddy Rivers*, 32 pp., illus.; 3, *Plants and Animals Live Together*, 48 pp., illus.; and 4, *Nature's Bank—The Soil*, 48 pp., illus. Published by National Wildlife Federation Inc. Four booklets attractively designed to familiarize young people, of grade-school ages, with the need for conservation of natural resources.

The Other Americans, by Edward Tomlinson; 456 pp., Charles Scribner's Sons, New York, 1943. An old-time traveler and lecturer here describes the lands of Latin America. The book has pictures, a pronunciation list, and a useful appendix, "Facts and Figures," as well as a good index.

Latin America in Maps, by A. Curtis Wilgus; 330 pp., Barnes and Noble, Inc., New York, 1943. A useful compilation of maps showing geographical, ethnological, and European backgrounds; the colonial, revolutionary, and national periods; boundary controversies; and Latin American relations with the United States and Europe. Maps and explanatory material are conveniently arranged. Good index.

Chile, a Geographic Extravaganza, by Benjamin Subercaseaux (Translated by Angel Flores); 255 pp., The Macmillan Co., New York, 1943. An unusually human treatment of Chile's complex geography, preceeded by some historical background.

Estudio de praderas y potreros en la ganadería ecuatoriana, by Carlos Katz; 94 pp., Departamento de Agricultura del Ecuador, Quito, Ecuador, 1943. A study of grasses in relation to cattle raising in Ecuador. Has numerous illustrations.

You Americans, edited by B. P. Adams; 348 pp., Funk and Wagnalls Co., New York, 1939. A collection of statements on the United States by selected foreign correspondents in this country. Contains chapters by Alberto Caprile, Jr., of Argentina, Carlos Davila of Chile, and Antonio Iglesias of Mexico.

The Latin American Policy of the United States, by Samuel Flagg Bemis; 470 pp., Harcourt, Brace and Company, New York, 1943. A historical interpretation of U. S. relations with Latin America by an outstanding authority. Has a geographical introduction and table estimating racial composition of American republics.

ALONG THE *Agricultural Front*

▲Cuba Holds First Soil and Fertilizer Congress

For the first time in the history of Cuba a National Congress of Soils and Fertilizers was held in Habana from May 30 to June 2, 1943. The Congress was called by the Minister of Agriculture in an effort to stimulate and encourage the study of land, soil, and fertilizer problems. Permanent officers were elected, many papers were read, a number of prizes were awarded, numerous resolutions were adopted, and plans were made for a second congress to be held at Pinar del Rio in June 1944.

Dr. Joaquín Martinéz Sáenz, Minister of Agriculture, was elected to be Honorary President and Dr. Luis M. Colón of the Inter-American Institute of Agricultural Sciences to be Honorary Vice President. Dr. Francisco Henares of the Agricultural University of Habana and Mr. Angelberto Fernández of the Fruits and Vegetables Association were chosen for the acting President and Vice President respectively. The Secretary and Vice Secretary selected were, respectively, Mr. Juan de Dios Tejada y Saínz, and Mr. Archibald Darlan y Nieto. The former is Secretary of the Technical Committee of the Association of Sugar Technicians, and the latter is a member of the Ministry of Agriculture.

The resolutions adopted dealt largely with a proposal to make a comprehensive survey of Cuban soils and an elaborate program for experimental work in bacteriology, erosion, artificial fertilizers, and other related activities.

It was voted to extend an invitation to Mr. Hugh H. Bennett, of the United States Soil Conservation Administration, and Mr. Robert V. Allison to attend the congress to be held next June. In recognition of the study of Cuban soils, made by Mr. Bennett and Mr. Allison, the Congress recommended that the President of the Republic present them with the Carlos Manuel de Cespedes decoration at the 1944 meeting.

▲Expansion of Rubber Collection in Central America

During the past year a remarkable increase in the collection of rubber in Central America has been accomplished by the collaboration of local governments and United States agencies. Now, some 700 workers are tapping the rubber trees in Guatemala, more than 3,000 in Nicaragua, and more than 1,500 in Costa Rica, in regions hitherto almost unexplored.

This increase has been accomplished against tremendous odds. Most of the rubber trees are in remote jungle areas, where the dangers of the jungle, such as snake bite, the malaria-carrying mosquito, and various tropical diseases, are added to the lack of proper drinking water and food, and the almost complete absence of transportation facilities.

The health and sanitation problems have been largely met by the Sanidad Pública in collaboration with the Servicio Cooperativo Inter-Americana de Salud Pública. They have sent to the rubber regions medical technicians or "practicantes," equipped with medical supplies, who, working out of the rubber camps, administer to the health needs of the rubber tappers and their families and attempt to put into effect environmental sanitation. The food supply problem was tackled by the Institute of Inter-American Affairs in cooperation with the local governments.

As a result, the Managua Banco Nacional in Nicaragua reports that more than 1,200 tons of rubber have been shipped from that country to the United States during the past year, and increasing supplies are coming from the other countries.

▲São Paulo Reports a New Orange Disease

Citrus growers in São Paulo, Brazil, are faced with the problem of a new and serious disease that is attacking their orange groves. A commission, formed to study the disease, is reaching the opinion that the disease is *podridão de radicelas* (rootlet rot), from which the orange groves budded on sour-orange stock have been suffering in the northern part of the Argentine Republic since 1932.

"Rootlet Rot" appeared in São Paulo only as recently as 1937; now it is found in all the important centers of the State.

The symptoms of the disease frequently appear rather slowly in the following manner: The normal bright green color becomes grayish; growth ceases; a chlorotic condition appears, first showing up in the new growth and then spreading to the entire plant; the old leaves fall, beginning at the branch tips and descending progressively to the main branches and trunk; and a secondary growth of foliage may take place, with very small leaves, green and nonchlorotic, but giving the plant a transparent appearance.

▲Mexican-American Commission Reports

The joint Mexican-American Commission for Economic Cooperation, appointed last spring by President

Roosevelt and President Ávila Camacho, finished its conferences on July 2 and has submitted its report.

The recommendations made by the Commission are for full cooperation between the two countries in order to attain maximum development of the agriculture and industry of Mexico and a steady flow of strategic war materials to the United States. They call for full development of Mexico's resources to furnish food, in concurrence with the recommendations made by the United Nations Food Conference; for expansion of industry—in immediate and long-range projects; for improvement of facilities for transportation and communication.

In this development the capital and technical skill of both countries must combine. "The days of exploitation or economic imperialism, whether by nations or by powerful private groups, are past," the report reads, "—no future Mexican or United States Governments will condone or permit their reappearance." Repair and replacement parts for machinery, and access to serviceable idle or used, as well as new, equipment are essential.

▲Venezuela To Have Modern Milk Products

Under Construction in Venezuela is an up-to-date plant for producing milk products. This is being built by the Compañía Anónima Industria Láctea Venezolana, a limited liability stock company controlled by Nestle's Milk Products, the Borden Co., and the Dairy Dale Co. of the United States. The Compañía entered into a contract on July 10, 1941, with the Government of Venezuela, whereby it was authorized to build the factory at Santa Barbara del Zulia in the State of Zulia. The total estimated cost is placed at about $1,500,000.

This factory was to have been completed by August of this year, but shortages of materials have delayed construction. It will probably not be finished until sometime in 1944. About 400 men are employed for construction work, and an average of about 200 will probably be employed in the factory when it is completed.

The plant is located on the bank of a stream that flows into the southern end of Lake Maracaibo. The surrounding region is the finest for dairy farming in Venezuela. Transportation will be by rail, truck, and coastal steamers. The dairy farmers of the region will be assured of a ready market for their milk, and products from the factory will be readily available for shipment to any Venezuelan port from the river docks which are planned by the Compañía.

In order to increase the value of the factory to the farmers, a model farm will be established, where demonstrations of the most efficient methods of milk production will be held. Since most of the farmers now use the bulk of their milk production for butter and cheese, prices for milk will have to be set at a level high enough to make the sale of milk more profitable. The strain of the herds, now mostly range cattle, will have to be improved to make possible greater milk production. The results of this building up will not appear for several years. The farmers must also be taught the basic principles of sanitation having to do with the delivery of whole milk.

A newly constructed spur line of the El Vigía-Santa Bárbara Railroad and a small fleet of barges on the river will bring the milk to the factory and, in turn, take away the powdered milk which the plant will manufacture to the inland points on the Caracas-Cúcuta highway. Small lake steamers will take a large part of the production to Maracaibo for transshipment to other Venezuelan ports.

The construction of the factory is a step in the direction of making Venezuela more economically independent. It will assure the farmers a steady market for their milk and may help to stabilize prices of milk, cheese, and butter. It will, to a great extent, free Venezuela from the need for imported milk products.

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AGRICULTURE IN THE AMERICAS HALLY H. CONRAD, EDITOR

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Gifts of the Americas

THE CHINCHILLA

by F. G. ASHBROOK

What lovely lady of fashion would not be thrilled to own a coat of Russian sable, and yet the little chinchillas of the Andes could furnish her with one even more sumptuous and valuable! Their fur, so soft and silky that "only the most sensitive human hand can feel its touch" is veritably worth a king's ransom, and, unless experiments in producing the animal in captivity prove successful to a marked degree, few can hope to own a chinchilla wrap.

The chinchilla is found high up in the Andes, 8,000 to 12,000 feet above sea level, in Peru, Bolivia, and Chile. It is a hopping rodent, somewhat like the common squirrel of the United States. Its body, which is ordinarily about 10 inches in length, is covered with fur about 1 inch long on the sides and shading from gray to clay color, sometimes almost white and again almost brown.

Formerly they were so numerous in their native habitats that a traveler could see thousands of them as he journeyed over the mountains, and many would run between the feet of the plodding pack mules on the winding trails of the Andes. Now they are fast becoming extinct and even the most adventurous trapper would find it difficult to catch enough to make one fur coat—even if laws did not prohibit him from catching or killing the little animals.

There are three kinds or grades of chinchillas in South America. The Chinchilla Real, or Chinchilla Plateado, is rarely found outside of a small district in Chile. It is more or less the color of cigar ashes and has no black fur on its back. The Chinchilla Cordillerana, or Chinchilla Boliviana, is most often found on the upper plateaus of Bolivia. With fur of bluish gray, trimmed with lines of black on its back, this animal is not valued so highly as the Chinchilla Real but is sometimes hard to distinguish from the more valuable animal. The Chinchilla Bastard *{Chinchilla laniger}* is a native of the low coast ranges of Chile and Peru. It is smaller in size than either of the others and its slightly reddish fur is undesirable.

Chinchillas have habits similar to those of rabbits and rats. They run swiftly by jumps and drop from high rocks with safety. The slightest movement or sound sends them scurrying to their burrows. When eating, they sit on their haunches and hold their food in their fore paws. They usually stay in their dens during the middle of the day but venture forth in the early morning and evening. They eat grains, seeds, fruits of shrubs, dry or green herbs, mosses, and lichens. The algarrobilla seed is their favorite food, and the pods are often found stored in their dens. They have been successfully raised in captivity on alfalfa, lettuce, and dry bread. Adults in captivity are difficult to handle, but their offspring are easily tamed.

A few fur farms have been established in South America, England, and the United States. If they and others prove successful, chinchilla fur may follow the course of the silver fox—once so highly prized and now so abundant. As yet, however, a bit of real chinchilla is too rare to be readily accepted as genuine.

Venezuela

Land

Venezuela, a triangular-shaped country on the north coast of South America, is one and a third times the size of Texas, with an area of 352,000 square miles. Mountains divide the country into four natural regions: The Maracaibo Basin in the northwest, the Northern Highlands, the Guiana Highland in the south and east, and the Llanos or plains lying between the two highlands. Estimates indicate that less than 1 percent of the land is cultivated.

Climate

Venezuela is in the Tropics, but average temperatures range from 95° in the low, hot Maracaibo Basin and the Llanos to 50° F. in the mountains above 6,500 feet. Except for the marked wet and dry seasons, there is little variation from month to month.

Population

The population of 3,500,000 is concentrated largely in the Northern Highlands. About 80 percent of the people are mestizos (mixed blood), and only 3 percent are Indians of unmixed blood. Almost two-thirds of the inhabitants are rural; in fact, only two cities have more than 1,000 people—Caracas, the capital, and Maracaibo.

Agriculture

Although the petroleum industry represents almost one-third of Venezuela's wealth, most of its people live on the land and make their living from it. Next to petroleum, coffee is the most important export, forming from 50 to 60 percent of the value of exports other than petroleum. Coffee production averages about 150 million pounds a year, more than half of which is grown in the three States of Táchira, Trujillo, and Mérida in the Northern Highlands. Between 30 and 40 million pounds of good-quality cacao are produced for export in Mérida, Sucre, and the Territory of Delta Amacuro.

Scarcity of labor, lack of facilities for transportation to markets, poor land on many steep mountain slopes, and primitive methods of cultivation have limited agricultural production. As a result much food must be imported, especially grains, potatoes, fats, and oils. The major food crops are corn, beans, yuca, sugar, plantains, bananas, wheat, and rice. Production is concentrated in the Northern Highlands, where most of the people live. Corn grows best in the area east of Lake Maracaibo; sugar, in the warm interior valleys and on the coast. Bolívar and Guárico, on either side of the Orinoco River, are the principal rice producers. Wheat, potatoes, and other Temperate Zone foods grow higher up on the mountains, largely in Mérida and Trujillo.

Venezuela has more than 4,000,000 cattle, for domestic meat consumption and for export. Good grazing land is available in parts of the Llanos, the two States of Apure and Guárico being the large cattle producers.

Forests

Forests cover about half of the country. In the Northern Highlands much of the original forest has been removed, but virgin timber remains south of the Orinoco River. Forest products of importance include tonka beans, divi-divi, balata, barbasco, and mahogany.

Foreign Trade

Petroleum accounts for from 90 to 95 percent of the total value of all Venezuela's exports. After petroleum, coffee is the most important export, and it accounts for 50 to 60 percent of all exports, excluding petroleum. Other agricultural and forest products exported include cacao, hides and skins, cattle, tonka beans, wood, balata, and divi-divi. Venezuela imports a variety of products, including many foodstuffs. The most important food imports are rice, wheat flour, potatoes, lard, and dairy products.

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IN THIS ISSUE

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NAMES & NEWS

Soil Conservation Trainees Depart

The trainees, or "collaborators," who participated in the course of study offered by the United States Soil Conservation Service to technicians from the other Americas, have returned to their homes or left Washington for other points of interest in this country. The group included: *Casiano Victor Quevedo, Arturo L. Somoza,* Argentina; *Paulo Parisio de Melo, Silvino Alqueres Batista, Jader Torres de Rezende,* Brazil; *Manuel T. Rodríguez, José O. Suárez,* Chile; *Luis Arturo Fernández,* Costa Rica; *Lucio R. García-Vásquez,* Cuba; *Gonzalo A. Moreno, Rodrigo Gonzalo Orellana,* Ecuador; *José Salvador Jauregui,* El Salvador; *Anthony Lespes,* Haiti; *Ricardo Alberto León, Javier García Paredes, Emilio Zamudio Sánchez, Gonzalo P. Andrade, Humberto Ortega,* Mexico; *Alfredo Gustale Antonelli,* Paraguay; *Mario A. Baracco, Fernando Sayán-Palacios,* Peru; *Carlos A. Fynn,* Uruguay; and *José A. Rugeles, Ricardo E. Jahn Adoue,* and *Sebastián Aníbal Romero,* Venezuela.

Peruvian Agronomists Hold Convention

The second annual convention of the Peruvian Association of Agronomists was held late in July at Arequipa. Various papers were presented on improvement of farm crops, livestock breeding, problems of insect and plant diseases, viticulture, and irrigation. The Association was organized in 1942 and has approximately 550 members, who are largely graduates of the College of Agriculture at La Molina and now engaged in various agricultural occupations. During the convention, excursions were made to typical dairy farms in the vicinity of Arequipa, a milk-evaporating plant, a flour mill, a tannery, and an irrigation project.

Chile Establishes Botanical Garden

A new National Botanical Garden has been created in Chile. It was formerly the "Salitre Park," which was developed by the Chilean Nitrate Sales Corporation, located near Viña del Mar, not far from Valparaiso. The Minister of Agriculture, the directors of the Nitrate Sales Corporation, the National Museum, and Professor T. Harper Goodspeed, of the Botany Department, University of California, were instrumental in its establishment. It is expected to be the forerunner of "the organization of a scientific institution of the highest type," stated the Chilean Minister of Agriculture.

Dr. Robert T. Clausen, of Cornell University and a collaborator of the Office of Foreign Agricultural Relations, has gone to Mexico, Jamaica, Cuba, and Central America to study and collect species of yam beans as possible sources of insecticide.

Dr. Lawrence W. Witt, Office of Foreign Agricultural Relations, is going to Ecuador to study farm-management problems, economic aspects of land utilization, and other basic problems related to the efficient development of tropical products.

Dr. Robert L. Fowler, Office of Foreign Agricultural Relations, has been assigned to the staff of the Cooperative Agricultural Experiment Station at Quevedo, Ecuador.

Dr. Paul L. Guest and *Dr. Robert L. Pendleton* have arrived in this country from the cooperative agricultural experiment station in Nicaragua.

Agriculture IN THE *Americas*

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Consider the Forests of Tropical America

The war is stimulating the demand for export woods to such an extent that foresters fear unwise exploitation of the virgin stands of tropical America. A sound policy to ensure future home requirements of forest products is recommended.

by ARTHUR BEVAN

The history of forest exploitation in temperate North America from the days when timber resources appeared inexhaustible to the formation of an organized conservation policy is indicative of the natural relationship between man and a valuable resource. The virgin forests, containing many valuable species, were cut over in such a manner that the margin between cost of obtaining forest products and their sales price was as wide as possible. There was nothing malicious in the manner in which the forests were exploited, but as it happened cutting methods that brought the greatest immediate profits were not compatible with what are now considered good silvicultural practices. With less than 20 percent of the original commercial forest area of the United States still uncut, conservationists, even with the support of Federal and State Governments, have been unable to balance the growth-drain budget. Only slightly more than one-half of the commercial forest area which has been cut over is being restocked in a "fair to satisfactory" manner.

Why is this true? Has the lumberman been at fault, or the economic system? Each probably contributed to some extent, but the real blame must be attributed to the indifference of the people who throughout the history of the country have, to a large measure, condoned or permitted the prevailing methods of forest exploitation. Only when wood shortages become acute will the public demand better silvicultural practices, thereby stopping destructive cutting of remaining stands, and bringing devastated lands back into production so that ultimately a sustained annual yield will be reached which will meet the requirements of the country for forest products.

For the present, however, the rate of depletion is being greatly accelerated by the needs of the war. Shortages of strategic materials are being alleviated by substitutes produced from wood, for when other raw materials are no longer available there is an almost universal tendency to turn to wood. For this reason,

High-value oak in Costa Rica.

the demand for wood and more wood is growing with each month of the war. How, then, in the face of these growing demands, can our depleted forests continue to produce our needs in the future during the long period necessary to bring our cut-over lands back into production? Will pressure to relieve this approaching pinch necessitate increased imports of forest products from the American tropics? Such a move is already under way, and the inter-American lumber trade is expected to grow rapidly.

Future Outlook

Tropical America is a region with many kinds of people making up the total population. Areas of dense population, such as most of the West Indies and the lands adjacent to large cities in Central America, are already denuded, but large forests remain in the countries of the mainland at least. Many of these forest lands are far from civilization; some are virtually inaccessible. A certain analogy exists between their present stage of development and that of the forests in the United States in 1800. By that time a limited amount of forest exploitation in the United States had already taken place, and the species and the values of some of the more important forest products were known. Possibly we are now on the threshold of another era of exploitation of virgin forests. Are the forests of Central and South America to be as ruthlessly cut as were those of the United States in earlier years, or will it be possible to stem the tide of depletion?

What is the present attitude toward forests and their management in the forested countries of the American tropics? The chief concern appears to be with the exploitation of valuable fancy woods for export and the discovery of other species which might be suitable for these same markets. A study of available literature, covering descriptions of forest stands, reports of forest officers, and planting programs in the Tropics, clearly indicates that this concern has been the incentive for nearly all forestry programs being followed. Forest laws in tropical American countries, where they exist, fortunately are more advanced than were those of the United States at a corresponding period of development, but the pressure of circumstances still largely dictates actual practice.

Denuded forest land—exploited for forest products and cleared for rough pasture.

In the main the tropical hardwood forests, which make up the bulk of the forest resources of these countries, are highly complex stands of many species. Species yielding valuable export woods make up only a small part of the forests. They average, perhaps, 1 tree to the acre, although sometimes they occur as occasionally as 1 tree to 5 acres. Cuttings made primarily for export species result in what is termed "high-grading"—skimming off the cream in forest values. In many countries, where forest exploitation is "organized," such species are being cut at a rate that will soon deplete them; certainly this is true where the timber is readily accessible. Under such a system logging costs are very high, damage to the remaining stand is excessive, and renewal of the valuable species is not being planned.

Population Needs Important

Consideration is not often given to the forest problem in the tropics of the Western Hemisphere based on the needs of the local inhabitants and their future welfare. Denuded forest lands are much more common than most people imagine. This kind of land abuse is found near all the heavily populated sections of this region. Despite this situation, no serious thought has yet been given to producing short-rotation, quick-growing forest crops that are suitable for fuel, stakes, posts, and other materials needed for local consumption. Yet these materials are necessary if the living standards of the peasant or peon class, which makes up by far the greater portion of the population of these countries, are to be improved. Import statistics of lumber and wood products, even in forested countries, are indicative of the almost total neglect of local requirements and of attempts to solve this problem. In most of the regions lumber imports could be substantially reduced by better utilization of forest products and proper management of local cut-over forest lands.

In some countries efforts are being made to maintain the forests through the planting of deforested lands with the more "valuable" species. Where successful, these may eventually help to supply the foreign market, but

Photo by Shirley

One-year-old teak at Siparia Reserve, Trinidad.

with the exception of teak plantations in Trinidad, little success has been attained to date. Past plantings in Puerto Rico may be cited as an example. Large expenditures were made on a forest program that centered around the planting of deforested lands. The first species tried was Spanish cedar, *Cedrela* sp., because this proved easy to grow in the nursery and early survival was high. These plantations, however, which were largely of a single species, later wilted and died, and today, as far as known, not a single plantation of cedar exists that can be called really successful. More recently, plantings were made of other fancy-wood species, such as mahogany, *Swietenia* sp.; teak, *Tectona grandis*; and maga, *Montezuma speciosissima*. On good sites some of these plantations are growing well. The mahogany planted in the shade of other trees looks good; but on poor sites or on denuded, abandoned, and eroded lands—the areas which should first be reforested—plantations fail or are found very expensive to establish.

Following the failures of "fancy woods," local species were planted; but, because previous interest was restricted to species producing high-value woods, little is known of the characteristics of these trees. Studies of the tree species which naturally grow on such sites must be made, and the value of tree species showing promise must be determined before reforestation at reasonable cost is possible. Reforestation programs are almost certain to start from and around centers of greatest need—that is, centers of high-population density where extensive areas are denuded. This is the plan being carried out by Mexico, and it has much of merit in it, not only from the viewpoint of supplying the greatest need first, but also for the psychological and educational effect on the people. The plantations must be successful, however, to secure continued and increased public support.

If the vision of high profits in the distant future from the production of exportable fancy woods is not to "rule and ruin" the domestic forest economy of tropical America, due consideration must be given to the development of a policy which recognizes that supplies for domestic utilization are of first importance. Provision for the production of "luxury" woods should be secondary to the maintenance and management of sufficient areas of forest land under sustained yield management—management for a continuous yield—to supply present and prospective domestic needs. This does not necessarily mean that the production of forest products for export need be restricted to areas not producing for domestic needs. On the contrary, the proper management of these lands will restore them ultimately to a more normal condition where such species can be grown 1 or 2 trees to the acre as in the virgin forest.

Luxury Trees in Forests

There is evidence to indicate that the reestablishment of a forest will permit successful introduction of "luxury" species on sites where pure plantations of such species have proved a failure. Such introduced luxury trees could be carried over as growing stock through several rotations of the less valuable species in the stand. The cutting of the latter will supply the local market and pay the costs of carrying the slower growing fancy woods. This would develop a system somewhat similar to that which is often practiced in Europe with hardwood forests and known as a "coppice with standards." (A "coppice" is a hardwood forest which, when cut, sprouts and grows vigorously and is cut at frequent intervals for forest products, such as fence posts, firewood, charcoal, etc. The "standards" are the slower growing trees which are left over a much longer period, eventually producing high-value lumber and timber.)

Spanish cedar log. Typical example of "high-grading" in Panama.

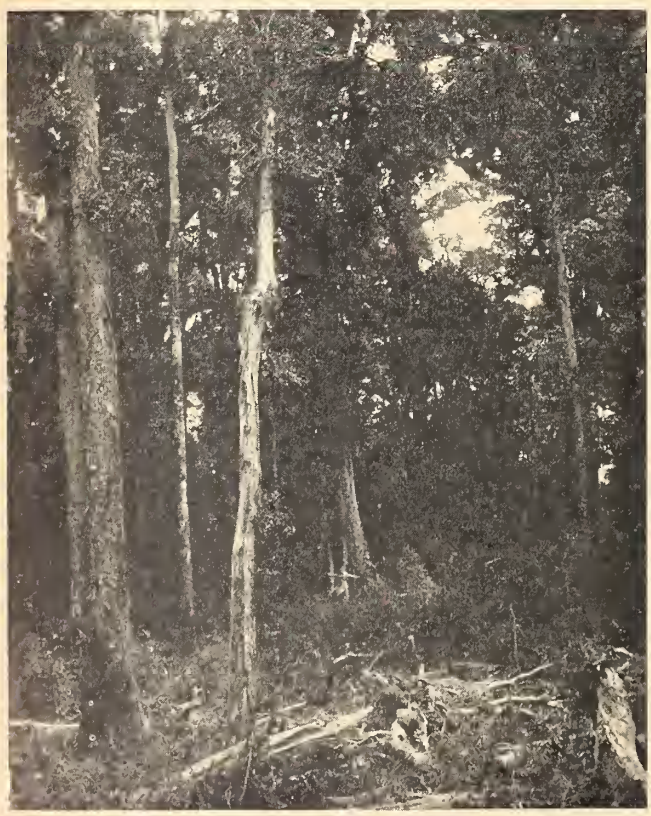
A sound forest policy should be based, in the order named, on: (1) The needs of the local population; (2) determination of the properties and uses of the more common species for lumber and other wood products for home consumption; and (3) the production of "luxury" fancy wood for export.

Such an approach should solve the problem of proper utilization and management and lead to perpetuation of the high-value species rather than their elimination under present destructive high-grading methods. On permanent forest lands, a method of management such as has been suggested is more compatible with natural processes, and the economy of such extended use is obvious.

Brush Important

Consideration should be given to the fact that areas of what most foresters would consider brush, composed of so-called inferior species, close to centers of dense population, have a much greater present value than a distant forest containing high-value fancy woods but now economically inaccessible.

The recent cutting of a tract of pomarrosa, *Jambosa jambos*, in Puerto Rico close to transportation facilities illustrates the extraordinary values occasioned by proximity to market and a dense population. This stand was coppice and about 12 years old, with the largest stems 7 inches in diameter at breast height. This pure stand, clear cut, yielded posts, poles, stakes, charcoal, and firewood which gave a net return of over $40 per acre per annum. This may have been an extreme case, but it showed definitely that, where a domestic market exists, it is just as important as an export market. Much of our high forest with fancy woods will probably not give such a return as did this coppice.



Typical tropical forest, Costa Rica.

Large areas of cropland in tropical America possibly will be left idle following the war, when certain large agricultural-production programs, now very necessary, become less important. In past times of high agricultural prices large areas of forest land have been cleared for growing crops which, when disease or low prices came, were abandoned. Naturally the poorer and most eroded areas were abandoned first. The sugar boom in Cuba in 1920 affords an example. Large areas of sugarcane were abandoned when the slump came. Imagine the forest that would exist today on these areas had a policy of reforestation been followed.

Peacetime Adjustments

With the coming of peace, when products are again procurable from lands now cut off from world markets, similar abandonments will occur. Are these areas to become an impenetrable jungle of weeds, vines, and brush? If provision is made to see that forests are restored on them, not only will the rebuilding and protection of the soil for the future be ensured, should a need for these lands arise, but a supply of wood products for local use and for export will be provided. Such areas have usually been provided with a ready means of access and can help to support the economy of the country if properly utilized.

The war has already caused a change in the general point of view and is encouraging consideration of the home requirements in a country. Much more should be done, however, and research in particular should be directed toward a solution of these problems which will receive added consideration with the coming of peace. New territories will be opened up for settlement, and the tropics of the Western Hemisphere offer a fertile field for such purposes. A new and up-to-date forest policy must be prepared, which will not perpetuate the mistakes of the past. If provision for domestic needs is made now, first by keeping all true forest lands in forest, and then by keeping them productive to the extent that at least domestic needs are met, production of forest products for export will then assume its proper role in the forest economy of tropical American countries, that of a surplus output over and above all local needs.

Nicaraguan Agriculture Looks Ahead

Tangible results from the cooperative efforts of the past year can already be noted in Nicaragua. With trained scientists to assist in developing new crops and improving the old, Nicaraguans view their agricultural future with optimism.

by PAUL L. GUEST

Derris, roselle, abacá, *Hevea brasiliensis*, cinchona, cryptostegia, sesame—these words are frequently heard as Nicaraguan agriculturists look ahead to new crops and an improved agricultural economy. The old stand-bys—coffee, rice, cotton, corn, sugarcane, mahogany, and cattle—also are slated for improvement under Nicaragua's program for expanded agricultural production.

An important role in the plans for agricultural development is that played by the cooperative agricultural experiment station set up jointly by Nicaragua and the United States as described by Dr. Ross E. Moore in an earlier article ("What Shall the Americas Grow?" AGRICULTURE IN THE AMERICAS, May 1943). This station is one of a number established cooperatively in the other American republics to serve as centers for stimulating production of crops complementary to the agriculture of the United States.

The station in Nicaragua is located in the vicinity of El Recreo. The Agreement under which it was established was made by the Government of Nicaragua and the Government of the United States on July 15, 1942. The United States Department of Agriculture, through the Office of Foreign Agricultural Relations, sent a group of agricultural scientists to Nicaragua to assist in its establishment. Its present staff consists of Dr. Robert L. Pendleton, world-renowned, tropical-soils scientist, as director; Dr. Paul L. Guest, in charge of horticulture; Dr. Arthur G. Kevorkian, pathologist and entomologist; and Dr. S. Healea Work, animal husbandman.

A topographic survey of the building site has been completed, preliminary plans for the station buildings have been drawn, and clearing of land for nurseries, roads, etc., is under way. Plantings have already been made in available areas. In general the work of the station will be centered around rotenone-bearing plants, cinchona, rubber, basic food crops, and livestock. Farmers will be encouraged to meet domestic food requirements while also producing complementary crops for export.

The Government of Nicaragua, under the guidance of President Anastasio Somoza, himself an ardent agriculturist, is taking steps through its Ministry of Agriculture and Labor to give increased attention to the expansion and improvement of the agricultural industry of the country. General José M. Zelaya C., a former student of Cornell University and now Minister of Agriculture and Labor, is genuinely enthusiastic about the bright prospects for the future, and is aiding in this expansion and development.

The work of applying scientific methods in agriculture really began in 1928, when the Ministry of Agriculture and Labor was set up. With agricultural inspectors stationed in most of the Departments of Nicaragua, the Ministry has been in close touch with the industry's needs and has aided growers and livestock men throughout the country. It has also been training young men in agriculture at the *Escuela Nacional de Agricultura*, which was established at Chinandega in 1930. This national agriculture college, which has 6 instructors and facilities for 45 to 50 students, offers a 3-year course of study, free of charge, in several different branches of agriculture. Upon satisfactory completion of the work, the degree, *Perito Agrícola y Experto en Veterinaria*, is conferred upon graduating students.

The *Centro Experimental Agrícola de Masatepe*, which is located near Masatepe in the heart of the Carazo coffee district at an elevation of approximately 1,500 feet, also

Photos by Dr. Pendleton

Town of Matagalpa, famous coffee and vegetable center, with highlands in background.

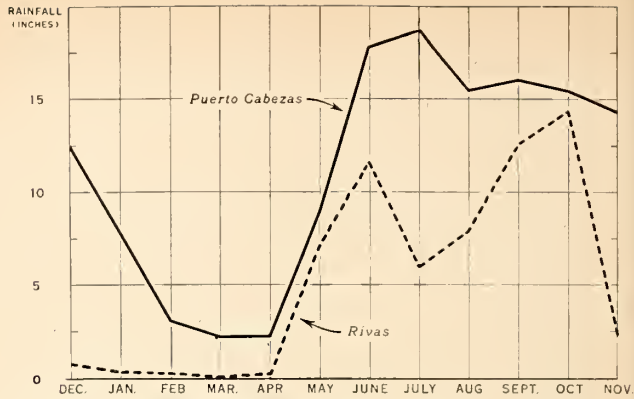
was founded by the Ministry in 1930. A small botanieal garden was established here, but at present the Centro is mainly a plant-introduction station, where imported plants are set out in field plots for trial and multiplication.

Principal Agricultural Areas

Improvement of agrieulture in Niearagua involves mainly the Atlantie-eoast area, the Paeifie-eoast area, and the Matagalpa Highlands seetion—famous for its coffee and vegetables—whieh lies between a portion of the two eoastal regions. The Atlantic and the Paeifie areas are entirely different and are remote one from the other. The low, flat coastal plain along the Atlantie coast is subjeet to heavy rains and high humidity during mueh of the year, whereas the Pacifie eoast has a pronounced 6-month dry period from about November 15 to May 15. During this period, a range of mountains and highlands extending more or less in a north-south direction through the eentral portion of the country obstructs the passage of the easterly and northeasterly trade winds, whieh sweep in billowy rain elouds from the Caribbean Sea.

In February, Mareh, and April partieularly, the two sections are separated by a rather definite line of demareation, whieh has been referred to as the "fenee line." This is elearly visible from the air on the east-west trip from Bluefields to Managua, or return. It also is easily distinguishable in riding over the route of the Atlantie highway whieh runs in a generally east-west direction from Managua to Rama. From the Atlantie eoast to a point somewhat east of La Libertad, the vegetation is luxuriant and green, whereas west of this "fenee line" and extending to the Paeific, the lands are brown and parehed during the dry season. Transportation between the two areas is earried on largely by air and the long, tedious water route via Lake Nicaragua and the San Juan River, although the opening of the new Atlantie highway for all-weather traffic is hoped for

Landing site on the Mico River at El Recreo Agricultural Experiment Station.



Average monthly rainfall at Puerto Cabezas (Atlantic Coast) and Rivas (Pacific Coast), Nicaragua. The annual average at the former during 1927–42 was 135.8 and at the latter during 1931–42, 62.9 inches.

within a few years. The sparse population of the east coast is made up predominantly of Indians and Negroes, with many Chinese merehants. Excepting the Indian dialeets, a particular brand of West Indian English is the main language spoken. The Pacific eoast is more heavily populated and is distinctly Spanish American.

East-Coast Region

Niearagua's vast east-eoast region is charaeterized by high rainfall during most of the year, high humidity, a wide expanse of low, relatively flat land through whieh wind many rivers. During the heyday of a quarter of a century ago, the banana was king along the Nicaraguan east eoast, and the eountry was one of the world's leading exporters. With the advent of the sigatoka disease, however, the industry declined rapidly, and reeently the only remaining exporter eeased operations on the Coeo River, the last eommereial area for export in the country. Years ago, dreams of a vast lumber industry ereated from the pine forests whieh extend from near the Coeo River almost to Pearl Lagoon, resulted in the building of huge mills, railroad shops, ete., at Puerto Cabezas, but the enterprise did not maintain its grandiose beginning and has now faded into the past. A prospective rubber industry also was eut short, when a hurrieane in 1906 destroyed all but a handful of *Hevea brasiliensis* trees in the original planting at Cukra Hill.

In spite of these reverses and set-backs, agrieulturists along Niearagua's east coast are looking ahead with eonfidenee. Large quantities of rubber are now being produeed from extensive stands of wild Castilloa trees seattered along the valleys of the numerous rivers whieh flow through the region. Interest in Hevea rubber also has been revived, and a rapid expansion of aereage, at present primarily along the Escondido River, is taking plaee. The experiment-station staff and the Bureau of Plant Industry of the United States Department of Agri-

culture, in cooperation with officials of Nicaragua's Ministry of Agriculture and Labor, are establishing extensive nurseries at both El Recreo and Cukra Hill for the propagation of budded, high-yielding trees, which will be set out in commercial field plantings.

Extensive lands along the rivers are favorable for the production of derris, abacá, spice plants, and others, and experimental plantings of these crops made at the El Recreo experiment station will be used in this area. Improvement in the production of subsistence crops—rice, corn, beans, vegetables—also is part of the program to better agricultural conditions along the east coast. These crops are confined to the narrow river banks and the alluvial "vega" lands which adjoin the rivers. A sharp-pointed stick for planting and a machete for weeding are the main agricultural implements used at present. The Office of the Coordinator of Inter-American Affairs has several agricultural technicians stationed on the east coast to assist in improving methods of production of these various subsistence crops.

Nicaragua's east-coast forests are yielding vast amounts of highly prized mahogany lumber. The industry has increased greatly during the last 2 years to give a new impetus to forest products as a source of export. The trees are felled during the season of decreased rainfall in order that the timbers may be lined along the streams when they are at a low level. With increased rainfall, the floods carry the logs to coastal sawmills. Felling has increased at such a rapid rate that the Ministry of Agriculture and Labor already has called attention to the need of reforestation to ensure future supplies.

Survivors of an old nursery of *Hevea brasiliensis* rubber trees at Cukra Hill.

Preparing fiber from agave near Matagalpa.

A small amount of coconut oil is produced by a primitive hot-water process for shipment to Managua for soap making, although the supply does not meet the domestic demand. Numerous small plantings and dooryard trees of cacao are found scattered along the rivers, but there is only a very limited production at present. Seedling sweet oranges are also abundant around home sites, and the quality is generally good. Many cattle also are distributed over the east coast, primarily for local consumption.

West-Coast Region

The climate along Nicaragua's west, or Pacific coast, is characterized by 6 months of dry and 6 months of wet weather. And when it is dry, it is dry! Two-wheeled oxcarts sink in the dust almost to the axle in some of the light, porous, volcanic-ash soils found over much of the region, especially from León northward beyond Cristobal Volcano. This Pacific-coast section, a long, comparatively narrow area—bounded on the east by a series of volcanoes (Cristobal, Casita, Telica, Pilas, Momotombo, and Mombacho), Lake Managua, and Lake Nicaragua; on the west by the Pacific Ocean, extending from the Gulf of Fonseca on the north to the border of Costa Rica on the south—comprises the most important agricultural region of Nicaragua at present. Coffee, corn, sugarcane, sesame, cotton, upland rice, tobacco, cacao, dairy cattle, cheese, and other agricultural products, combine to make this an area of great importance. The iron-tipped wooden plow and oxen are giving way to tractors and mechanized equipment in this progressive section.

Coffee, long one of the export leaders, is destined to continue to be of prime importance in Nicaraguan agriculture. Commercial production is confined primarily to two sections: the Carazo district and the Matagalpa area. High yields are obtained in the Carazo section, which extends from an elevation of about 1,500 feet to 2,500 feet, although, due to the long dry period, occasionally a shortage of water for washing coffee is a serious factor. Many of the plantings are on comparatively level land or land with only a moderate slope, which facilitates field operations. Matagalpa coffee is produced largely from hillside plantings north and east of the town of Matagalpa, which is about 83 miles northeast of Managua via the Pan American Highway. The elevation varies from about 2,500 feet to 4,000 feet with cool temperatures, many cloudy days, high humidity, and considerable rainfall throughout the year. Due to lack of automobile roads, most of the coffee is sent by pack mule from the haciendas to Matagalpa for transshipment by truck to Managua. Nicaragua's coffee exports in 1942 totalled $3,879,000 and led all other agricultural exports in value. Coffee probably will continue to hold its lead, but Nicaraguan growers are looking ahead to new crops for export.

Nicaragua, once known as "the granary of Central America," is attempting to regain this position with increased plantings of corn and upland rice. Although corn is grown in every section of the country, the real corn belt extends from León to north of El Viejo in the Pacific-coast area. Two crops per year are raised, the first being planted in May at the beginning of the rainy season, and the second during the latter part of August and in September. With the exception of recent efforts by one or two planters, no corn-improvement program has been carried out, although many growers select certain seeds for planting. From year to year the yield of upland rice fluctuates from almost nothing to a bountiful crop, according to reports of farmers in this region. At present the acreage seems to be increasing.

The production of sugarcane has been one of the country's major industries for many years. The Nicaragua Sugar Estates, largest producer of sugar in the country, has been in operation since 1890. The company's Ingenio San Antonio, near Chichigalpa, is ideally located for the production of cane. The wide, flat plain of friable, volcanic-ash soil permits rows to be planted up to a length of more than a mile and greatly facilitates harvesting. Five dams, constructed on the streams which flow through the hacienda, ensure an adequate supply of inexpensive irrigation water for the dry season, and the streams afford a means of surface drainage when torrential rains occur.

At a time when the production of edible oils is of great interest to the United Nations, Nicaragua proudly points to the high-quality sesame produced in its fertile west-coast region. Almost unknown in Nicaragua 6 years ago, this crop has assumed one of the leading positions in production and export. Investigations of various cultural problems are being planned by the staff of the agricultural experiment station. The country, lacking a satisfactory oil mill of its own, exports the seed for pressing elsewhere. Formerly, the bulk of the crop moved to the United States, but most of the 1942 production found a market in Costa Rica, much of it being pressed at the modern Mexican-owned mill of the Compañía Costarricense de Aceites y Grasas, S. A. at Alajuela, Costa Rica. If economic conditions justified such a move, the present production of sesame could be increased several fold with relatively little difficulty.

Cotton probably has been grown in the country for 75 years or more. No definite statistics on production are available, but estimates place the 1942–43 crop at the equivalent of about 4,000 bales of 500 pounds each. Since most of the fields are picked just once and ginning is poor, grades have been low, although efforts are being made to improve these conditions.

Excellent Virginia-type tobacco, grown for national use on the Island of Ometepe in Lake Nicaragua, and high-quality cacao from Rivas, some of which is exported to the United States, also add importance to the Pacific-coast agricultural region. Castor-beans and peanuts for oil can be grown if export markets develop. Experimental plantings of roselle for fiber, cryptostegia for rubber, and other new crops have recently been made in this area.

Livestock Industry

The production of cattle—triple-purpose cattle, since they are used for beef, milk, and as oxen—probably has commanded the thought and attention of Nicaraguan agriculturists more than any other branch of the country's agricultural industry. Native or Criollo cattle predominate in many areas, although the number of such cattle as a distinct "breed" is gradually diminishing through crossing with almost every known major beef and dairy breed in North America. The importation of bulls has been principally from the United States and Costa Rica. Production is not centered in any one area but extends through the vast central portion of the country from Chontales to the Honduran border and along the Pacific coast. Cattle are exported on hoof to other Central American countries and Panama. Some of the large dairies with 400 or more cows convert all their milk into butter and white cheese, the universal "queso blanco," of Latin America. Managua boasts of the only modern milk-pasteurization plant in the country, but Nicaragua is looking ahead to more sanitary methods of production and distribution of its dairy products.

Agricultural Education in Mexico

Agriculture in Mexico presents something of a paradox—rich soils and varied climate are offset by rugged terrain and inadequate communications. Agricultural schools provide means for introducing improved methods to widely scattered farming regions.

by MARIANO QUIROZ

All climates exist in Mexico, thus making all crops possible; from this point of view, one may say that the economy of the country depends largely upon agriculture and the livestock industry. Of course, some Mexican economists state that the country's future lies in industrial development. This statement may be accepted, but it will not be wholly true until the nation has expanded its industrial undertakings sufficiently to reduce the number of farmers in relation to the total population, for at present they represent 70 percent of all workers. This will take a long time, and even when it happens no one will be able to deny that Mexico still has great agricultural importance.

Our agriculture is carried on in a simple way year after year. Its dependence on a single crop throughout many generations, together with the primitive practices employed, makes the task of teaching modern methods difficult. This is the objective, however, of agricultural education in Mexico. We can proudly say, after 15 years of experience, that we have reached an advanced stage in this work and have 14 Vocational Agricultural Schools. The annual budget allotted for this type of education is approximately 2,250,000 pesos (nearly half a million dollars).

Courtesy of Pan American Union

Front of Main Building of Agricultural School, La Huerta.

A school of this type has been established in each of the following States: Puebla, Hidalgo, Guanajuato, San Luis Potosí, Sonora, Durango, Sinaloa, Yucatán, Tamaulipas, Veracruz, Tlaxcala, and Chiapas. The State of Michoacán has two, one at La Huerta and one at Guaracha, which is in a semitropical region.

The state of Jalisco expects to have an agricultural school soon. The government of the State has been greatly interested in it and has cooperated in its establishment.

All the schools of vocational agriculture are supported by the Federal Government, with the exception of the one in Hidalgo, which receives from the State government a monthly allowance for its maintenance of 3,000 pesos.

The first school was opened in 1927 at La Huerta, Michoacán, during the Presidency of General Plutarco Elias Calles. The cost of building and equipping this school was 2,000,000 pesos. The Roque School in Guanajuato and Santa Lucia in Durango were soon opened in like manner. The buildings for these three schools were constructed in accordance with modern requirements of education and hygiene.

The other schools have been opened on various dates and under varying conditions. Their buildings were not especially constructed for school purposes but were reconditioned from those on old farms or estates. They, as well as the livestock and equipment, are inadequate, and an attempt is made to improve them every year.

The quota of each of the 14 schools is set at 200 pupils, but the size of the farm in some cases permits only 100. The annual registration averages 1,500 students.

The schools admit boys who are from rural areas only, who are from 14 to 20 years of age, and who have finished their primary education. Before admission they are required to pass an examination on subjects studied in the primary schools and a physicial examination to show that they are in good health.

Courtesy of Pan American Union

One of the fields at the Central Agricultural College of Michoacán.

Their studies continue for 3 years, known as first, second, and third agricultural years. Each working day consists of 8 hours, divided into 4 hours of theoretical work in the classrooms and 4 hours of practical work—in the field, with livestock, in the shops, and in rural industries.

The Government does not attempt to produce professionals but practical, technically trained farmers. In order to make this purpose better understood, the agricultural schools are now called "Practical Schools of Agriculture."

Eventually some of the more proficient students are given an opportunity to continue their studies in the College of Agriculture or of Veterinary Medicine. At the present time, after completing their 3 agricultural years, they can continue studying for another year, specializing in some subject, such as livestock, dairying, poultry raising, agricultural machinery, or rural industries, for which additional courses have been established in the various schools.

During the 15 years since the establishment of these schools was undertaken, serious difficulties have been encountered. A large percentage of the students have not returned to the country but have used the culture and instruction that they have received for work in the city. Others have frequently left school without completing the course of instruction. A lack of trained personnel to direct the schools and teach in them has limited their usefulness. Finally, the schools have weathered political, economic, and many other kinds of storms. That they have survived serves to demonstrate their importance and the need for them to continue advancing and increasing in number. They offer the only opportunity available to the farm boys of Mexico, of whom the majority are poor and unable to pay tuition in any school.

At the present time, Dr. José Parres is at the head of Agricultural Instruction in Mexico. Dr. Parres has a profound knowledge of the agricultural problems of the country, having been attached to the Ministry of Agriculture for 14 years as Assistant Secretary and Secretary. With great ability and good faith, he has attacked the obstacles that barred the road to perfect success for the Schools of Agriculture and is striving to overcome each of them with patience and firmness. He works in close cooperation with the individual directors of the schools, who explain their difficulties, and they study them with a view to their elimination.

The President of the Republic of Mexico has expressed his desire that these schools shall fulfill the duty with which they are charged and that, when those now in operation are functioning harmoniously and in order, the number shall be increased until there is one in each State of the Mexican Union.

Babassú—A Hard Nut to Crack

The potential wealth of Brazilian babassú nuts staggers the imagination. Yet full utilization of Nature's lavish gift is prevented by problems difficult to solve under present conditions.

by GEORGE E. ADAMES

The wooden mallet was incongruous in the hand of the well-dressed, prosperous Liverpool merchant, who was staring glumly at the dozen fist-sized nuts strewn before him on the sturdy oak table. He took off his fine black broadcloth jacket, handed it to one of the men standing near the table, and said slowly, "I'll try once more—just once again."

The sturdy Briton hammered savagely for a full minute at a brown nut; then with a look of annoyance tossed the mallet on the table and wiped his forehead with a crisp lawn handkerchief. "Gentlemen," he said, as he adjusted his cravat and donned his coat, "it's no use. I don't say they can't be broken open; but I say that they are not worth the effort. The Captain, here, says that the kernels inside are good to eat. Well, there are other nuts that are good to eat and not so hard to open."

The English merchant turned to the swarthy mariner who had anxiously watched the proceedings, and added crisply, "I'm very sorry, but we can't use them. They have no value."

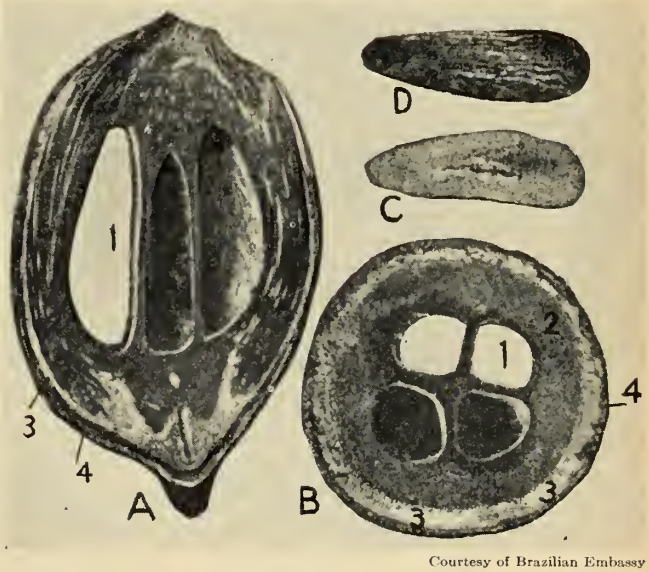
The Captain straightened his cap, murmured goodbyes in his rich foreign voice, and left the room. And as he walked down to the wharves on the Mersey, he repeated to himself, "But they are good and they are useful—if only there were a machine to open those nuts. . . ."

That night he hoisted anchor and took advantage of the east wind to sail out to sea. Two days later the cargo of babassú nuts was tossed out into the Atlantic. The voyage had been a failure.

And so, in 1867, the first export cargo of babassú nuts was rejected as virtually uncrackable and therefore useless; and almost 50 years passed before babassú fared forth from Brazil again. This time, however, the exporting firm was shrewder, and sent a cargo of babassú kernels, already extracted from the nut, to Germany. Here they were bought up immediately, for the Germany of 1911 started testing and experimenting, and found that the uses of the kernels were almost unlimited.

The Brazilians, who had utilized both tree and nut for centuries, knew a primitive way to open the nut, but it was tedious. The worker sat on the ground with a machete or hatchet grasped between his strong brown feet. Holding a nut firmly on the blade, he beat it with a heavy stick until it cracked; then he tore it open and picked out the four or six kernels that he found therein. These were delicious and fatty. In addition, the hard husk, or endocarp, made excellent fuel, and the layer next to the outside, the mesocarp, provided a starchy substance which could be ground and used as flour. The very outside layer, the epicarp (or pericarp), was fibrous and could be used in making brushes.

The palm had been utilized in dozens of ways in the interior and the northeast. The leaves could be woven together to make walls for huts or laid on the roof as a covering against tropical rains. The women split the leaves and used the fibers in the weaving of baskets, mats, fish traps, saddlebags, even hats. The whole nut was occasionally burned to produce oily smoke for the curing of wild rubber, and sometimes it was allowed to rot for use as fertilizer.



Courtesy of Brazilian Embassy

Babassú nut.

A. Longitudinal section. B. Transverse section. C. Kernel—interior. D. Kernel—exterior. 1. Kernel. 2. Endocarp. 3. Mesocarp. 4. Epicarp or pericarp.

The names given to the tree are almost as varied as the uses to which the palm and its products have been put. By most people it is now called babassú (or babaçú), but by others it has been designated as aguassú, baguassú, guaguassú, uauassú, buassú, coco de palmeira, coco de macaco, and coco de rosario. It even has more than one scientific name, some writers classifying it as *Orbignya speciosa*, others as *Orbignya martiana*, and still others know it as *Attaléa speciosa*.

The tree in its wild state grows profusely in Brazil. It propagates itself with great ease and is found in nearly half the Brazilian States. A tropical climate and plenty of rainfall are its chief requirements. Because of its density and abundance, the tree probably will never need cultivation on plantations, no matter how much it is exploited. The State of Maranhão, in northeast Brazil, already appears to be, to all intents and purposes, one vast babassú plantation and accounts for about 70 per-cent of the present production. Mato Grosso, Goiaz, and Minas Gerais are also important. Babassú palms are scattered over an area of some 33 million acres, and estimates of the number of trees in Brazil range from 5 to 25 billion.

Estimates of the potential production of the nuts cover a wide range. Some Brazilian sources claim that from 40 to 165 million tons a year of oil alone could be produced, not to mention other derivatives of the nut. In face of the obvious profusion of the tree, however, the total quantity of nuts gathered has been disappointingly low. In 1940 some 67,000 tons of nuts were collected,

Courtesy of Brazilian Embassy

Clusters of babassú nuts.

Courtesy of Brazilian Embassy

Cracking babassú nuts in Minas Gerais

and the output of oil amounted to only about 6,000 tons. Since 1936, when the value of the whole nut reached about 3 cents a pound, exports have ranged between 20,000 to 50,000 tons annually, with a rather uneven increase every year that seems to be tied with world business conditions.

Why has the development of this great source of potential wealth been so neglected? One reason is the extreme toughness of the nut, as previously noted. So far, no completely satisfactory apparatus for cracking the nut has been devised. There are machines that have sufficient strength for the 10,000 to 25,000 pounds of pressure required, but they suffer two great disadvantages. They are either too heavy to be moved readily from place to place as needed, within the producing area, or else they bruise the tender kernels, which then turn rancid within 24 to 48 hours. On the other hand, a machine that is light enough to be movable, or which cracks the nut gently, is usually too delicate for the crushing job it must handle and so breaks down within a short time.

Hand labor, while relatively harmless to the kernels, is slow. Minutes are required for the breaking of a single nut, and a day's production of kernels for one man may not be any more than 25 pounds, if that. Where whole families or other groups work on the extraction of the kernels, the work is divided in a primitive "belt" type of production—one person brings the nuts to the cracker, who splits the hard shells. After this, the nuts go to one or two people who pry the kernels out of the husks. Others, perhaps the children, gather the kernels in baskets or bags and clear the husks away.

Second, labor in Brazil is generally inadequate. More nuts could be gathered and more kernels extracted even by primitive methods of handling if there were enough people engaged in these activities. Few workers seem to occupy themselves exclusively with babassú, although the nuts are available almost the year round.

Laborers turn to the collecting of the nuts only when there is nothing easier or more profitable to engage their time. Just now, for example, some workers are being drawn from the babassú country to better-paying rubber production in neighboring states.

Third, even if sufficient nut gatherers were available to speed up collection, there is, unfortunately, a great paucity of roads in Brazil's interior. Distances are great, and the few existing railways are not equipped to do any more work than they now perform.

Under wartime conditions the products of the babassú have become vitally important, and, despite the problems involved, a Babassú Agreement was made by the United States and Brazil in July 1942. This Agreement, designed to be mutually helpful to both countries, now and after the war is won, provides for a sliding scale of premiums to be paid by the United States Government to the Government of Brazil for quantities of kernels available for export in addition to specified basic quotas. It was stipulated that the premium money be used by that country for the improvement of highways, docks, and railways. Production will undoubtedly be expanded during the 4 years covered by the Agreement, and Brazil has agreed to set aside 75 percent of the production for purchase by the United States. Improvement of the highways and railways in the babassú area has already been started with the money advanced.

Authorities have conceded that even the lack of a satisfactory nut-cracking machine can be side-stepped for as long as there continues to be enough hand labor available to split the nuts open and adequate transportation facilities. Estimates indicate that 75,000 people in the State of Maranhão alone are engaged in some aspect of the babassú industry, and a reasonable expectation is that not too many years will elapse before a really efficient cracking apparatus will be devised.

The fine oil—about 60 percent by weight—which can be expressed from the babassú kernels is most important

Courtesy of Brazilian Embassy

Babassú palms with clusters of nuts.

to the Allied Nations just now, because of its usefulness in soap making as a substitute for coconut oil, now unobtainable in sufficient quantities because of the war. Babassú oil closely resembles coconut oil and makes a whiter, more brittle soap.

It has probably already spared each of us the inconvenience of a soap shortage, for of the 10 billion pounds of fats and oils used in the United States every year, some 20 percent has been poured into the soap vats. With shipments of palm oil and coconut oil from the East Indies, the Belgian Congo, and the Philippine Islands cut off or curtailed, some substitute had to be found, for the middle of 1942 found United States supplies of soap oils and fats from regular sources reduced by one-third.

Babassú oil is also utilized in the manufacture of bullet-proof glass, and certain other parts of the nut and byproducts are usable in the manufacture of explosives. Babassú is valuable in the preparation of cooking oil and of margarine. In addition, the oil, as a light lubricant, is superior to cottonseed oil, in that it does not attack bronze. Furthermore, it has been found to be almost as good as petroleum fuels in the operation of Diesel engines and is adaptable for use in certain other internal-combustion engines for the operation of tractors and automobiles—a fact of interest not only to petroleum-thirsty Brazil but to the United States as well.

Supplies of babassú kernels now available from Brazil are far less than the 200,000 tons a year that the United States could probably use. The oil, therefore, is assured a market for as long as the war lasts and probably for some time after. It is now quoted in the United States at about 11 cents a pound in 100-pound drums, and processors are calling for more. As soon as channels of transportation and distribution in Brazil are improved, greater quantities will reach the United States.

Aside from the wartime needs of the United States, Brazilians foresee immense possibilities in the domestic utilization of the babassú nut. The crop has been estimated to have a potential value five times greater than that of the coffee crop.

From the hard shell can be extracted acetic acid, coke, and tar. Industry can make use of the acetic acid in the manufacture of varnish solvents, synthetic textiles, dyestuffs, and acetone—and acetone has hundreds of uses.

One writer proclaims that the São Luiz-Terezina Railway, the main railroad in Maranhão, could be operated with babassú husks as fuel. From the husks, also, can be rendered charcoal to operate the gasogenes, or charcoal-burning automobiles, which are coming more and more into use in Brazil. Farm machinery could run on babassú husks or babassú oil. In 1854—thirteen years before the ill-starred attempt to sell babassú nuts to English merchants—a speaker in Brazil's Provincial Assembly pointed out that babassú could become the economic savior of that country's great (and even yet undeveloped) northeast and interior.

Meanwhile, the Brazilian backwoodsman patiently balances the babassú nut on the blade of his machete and pounds it with a club. . . .

Reading ABOUT THE AMERICAS

The New World Guides to the Latin American Republics, Carl P. Hanson, ed.; Volume II, 139 pp.; Duel, Sloan and Pearce, New York, 1943. The second volume of the *New World Guides* contains travel information and background material on Venezuela, Colombia, Ecuador, Peru, Bolivia, Chile, Argentina, Paraguay, Uruguay, and Brazil. Although issued at a time when travel is seriously hampered by wartime conditions, it offers valuable material to all interested in obtaining a knowledge of the other Americas.

Cuentos de las Españas, by Jaime Homero Arjona and Carlos Vásquez Arjona; 195 pp.; Charles Scribner's Sons, New York, 1943. A book of stories in Spanish, with vocabulary.

Muestras de legislación social americana, by Ernesto Galarza; 71 pp. (mimeographed), Office of Labor and Social Information, Pan American Union, Washington, D. C., 1943. Gives samples of legislation in the Latin American republics, on consumers' cooperatives, child labor, social insurance, vocational teaching, profit sharing, work hours, workers' homes, compulsory savings, workers' courts, vacations, and other aspects of labor and social welfare.

The Battle for Buenos Aires, by Sax Bradford; 307 pp., Harcourt, Brace and Co., New York, 1943. The major part of this book gives first-hand account of Axis techniques in trying to win Argentine good will. It suggests methods that the United States should use to counteract these.

The Latin-American Collection of the Museum of Modern Art, by Louis Kirstein, 112 pp., 113 plates, Museum of Modern Art, New York, 1943. Contains historical introduction, explanations, biographies of artists, and catalogue, as well as the pictures themselves. Bibliography.

ALONG THE *Agricultural Front*

▲ Group Completes Study of Soil Conservation

Twenty-five young agricultural technicians from Central and South America, Mexico, and the West Indies, who came to the United States a year ago to study methods for conserving soil by controlling erosion, have completed their study.

Under the supervision of the Soil Conservation Service they worked out the various problems with the field staffs of soil conservation district units and at experiment stations in sections where they found climatic and soil conditions similar to those in their own countries.

This is the first time an extensive program of inter-American study in soil conservation has been carried on. It was made possible through the cooperation of the Soil Conservation Service with the State Department, the Office of the Coordinator of Inter-American Affairs, and the Office of Foreign Agricultural Relations of the Department of Agriculture. The statement of Dr. Hugh H. Bennett, Chief of the Soil Conservation Service, when he spoke to the group in Washington struck the keynote of the project.

"Three languages are represented among the delegates at this Washington meeting," he said: "the French of Haiti, the Portuguese of

Agricultural technicians from the other American republics, who recently completed their study of soil conservation in the United States.

Brazil, and the Spanish of the other southern countries. But in the work of soil conservation, all of us speak the universal language of the soil. That is perhaps the most enduring of all ties among the free Republics of the New World. Let us hope that this pioneer class will sow seeds of good will and good agriculture and that their example will be perpetuated."

▲ Jojoba Bush Source of Wax

In the semiarid sections of Mexico, Arizona, southern California, and New Mexico a rather recently discovered source of wax is causing considerable interest. It is the jojoba nut (pronounced ho-ho-ba) from a bush about 12 feet high that grows wild in those regions. Among other things the nut yields a liquid wax, which can be used as a substitute for carnauba wax, a rubberlike material that is resistant to acids and alkalies and is used for making candles, varnish, etc. Laboratory tests show that, when the liquid wax is treated with sulfur chloride, a material is produced which also may prove useful as a rubber substitute.

The jojoba nut is approximately the size of a large peanut kernel and contains one or two kernels. The bush begins to bear in the fourth year of its growth, and it continues to bear the nuts every year except in seasons of drought. The nut seems to be a delectable food for deer, stock, and other animals, for they usually strip the wild bushes before the nuts can be gathered.

Experimentation in cultivating the bush under irrigation is being made by a Cleveland company on a 64-acre desert farm near Florence, Ariz.

▲ More Fiber Being Grown for Home Use

Central and South America use literally millions of bags and millions of yards of burlap for moving their coffee, wool, cotton, sugar, and grain to market. With the curtailment of imports from the Far East, they are rapidly developing production of the necessary fibers at home.

Jute is being raised in large quantities in the Amazon Valley of Brazil, in Venezuela, Peru, and Argentina; henequen in El Salvador, Cuba, Haiti, and the Dominican Republic; fique in Colombia; and *guaxima* (*Urena lobata* Cav.) in Brazil. Thousands of acres are planted to abacá for Manila hemp in Central America, and to roselle, considered an excellent substitute for jute.

The fiber plants grow well in these countries—two jute crops are produced in a year—and already fibers for bagging, twine, and rope are not only meeting home needs but are becoming an important item of export.

▲ Production of Tung Oil Increases

Tung oil, one of the most important vegetable oils, is now being produced in increasing quantities in the other Americas. Before the war the world supply came from China. Now Brazil, Argentina, and Paraguay are growing tung trees, and several other republics are experimenting in the industry.

Tung seedlings are often set out among coffee trees. Since the tung root goes deep into the ground, whereas the coffee root system is near the surface, there is little competition for nourishment. Even though neither crop would produce as much as if planted alone, the two together yield a larger and more stable income per unit of land than one. For example, in 1942 the coffee crop suffered heavily from frost, but tung trees were little affected.

Argentina began planting tung trees in 1929. Now thousands of acres are given over to that industry, with several processing mills.

The tree grows to 30 feet or more and normally lives about 35 years. Clustered snow-white or pinkish flowers in the spring, followed by broad, dark-green leaves, make it ornamental as well as useful. Between the third and sixth years the tree begins to bear the fruit, which is 2 or 3 inches in diameter and resembles a small tomato in shape, though darker in color.

The oil comes from the fruit and is used chiefly in paint and varnish.

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AGRICULTURE IN THE AMERICAS HALLY H. CONRAD, EDITOR

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Gifts of the Americas

THE PEANUT

by ELIZABETH P. TAPPY

The peanut, a valuable American food product, is not a nut but a legume. Its little-known scientific name is *Arachis hypogaea* which means "growing beneath the ground." In the more popular vernacular it is known by a variety of names, such as peanut, ground pea, goober, pinder, and groundnut. One of the many Latin American names is *maní,* already familiar to many of us in the popular Cuban "Peanut Vender" song.

Americans can well feel proud of the peanut as one of America's gifts to the world, for it originated in the Western Hemisphere. Historians state that peanuts have been grown on American soil since about 950 B. C. Excavations in a prehistoric cemetery near Ancón, Peru, revealed not only vases decorated with peanut designs but calabashes or gourds containing peanuts in the graves of Inca women.

Peanuts did not come directly to the United States from Peru, however, but crossed the Pacific to the Orient and the Atlantic to Africa. The arrival of the peanut in the United States was simultaneous with the advent of Negro slaves. There is evidence that during the time of Negro-slave traffic traders loaded quantities of peanuts in the ship holds with their captives, and peanuts served as their only food.

Thomas Jefferson, in 1783, mentioned the fact that peanuts were being raised in Virginia at that time for home use only and as a garden herb. Other writers of the eighteenth century reported that peanuts were grown in small patches, like popcorn, and distributed among the children at Christmastime by relatives.

Peanuts were cultivated sparsely in the South before 1860, but the War of 1861–65 gave an impetus to the growth of the peanut industry. Soldiers of both sides, campaigning in Virginia, tasted peanuts, liked them, and went home after the war with the desire for more. Between 1865 and 1870 peanut production increased by 200 to 300 percent, and cultivation spread rapidly from Virginia to North Carolina and Tennessee and later into a large number of Southern States corresponding roughly to the Cotton Belt. P. T. Barnum's Circus and Italian, Greek, and Irish street venders helped to popularize the peanut. Now it is as integral a part of publicly vended refreshments at ball parks and circuses as the American stand-bys, the hot dog and the ice-cream cone!

In addition to its popular use as a confection, the peanut is valuable as a food, because it is a source of such necessary vitamins as A, B, and G. For that reason, the Government is encouraging the production of peanuts. They yield edible oil and leave a residue of meal, which is valuable for livestock feed. One pound of peanut meal can provide a substitute protein feed equivalent to 4 pounds of grain. Although the industrial products of peanut oil vary widely from shaving creams to lubricants for the finest watches, the accent at the moment is on edible oils and feedstuffs in order to attain the unprecedented goals set for cooking oils, meat, and dairy products.

ECUADOR

Land

Ecuador—the Land of the Equator—is situated on the western coast of South America, between Colombia and Peru. Under the most recent boundary agreement between Ecuador and Peru, the estimated area totals 96,300 square miles for continental Ecuador and 2,870 square miles for the Galapagos Islands.

Ecuador is divided naturally into three regions by two parallel ranges of the Andes Mountains running from north to south. To the west of these ranges lies the Litoral or coastal area, which slopes gradually from the foothills of the Andes to the Pacific Ocean. The area lying between the two mountain ranges is known as the Sierra or Inter-Andean Plateau. To the east are the vast forested plains of the Oriente, which extend to the Amazon Valley.

Climate

The climate of Ecuador is not so hot as might be supposed from the fact that the country lies on the Equator. The climate varies in temperature and humidity according to altitude and ranges from the humid heat of the tropical lowlands on the coast to the cold of the Andean highlands.

The occurrence daily of the "garua"—a dripping fog similar to the redwood fogs of California—influences temperatures and crops.

Population

According to an official estimate made in 1941, the population of Ecuador, including the Galapagos Islands, numbered 3,011,062. The heaviest concentration is in the Sierra region.

Agriculture

Both Tropical and Temperate Zone products are produced in Ecuador. Cacao, coffee, cotton, rice, bananas, oranges, and pineapples are grown in the coastal area. Barley, corn, rye, wheat, potatoes, beans, peas, and lentils are produced in the Sierra region, which is also the livestock zone of the country. The Oriente region is as yet unproductive agriculturally.

Ecuador is practically self-sufficient in most Temperate Zone products, except wheat. Apples, pears, peaches, and other deciduous fruits are also grown for domestic consumption. Cacao is the leading export crop, followed by coffee and rice. Ecuador is the third largest exporter of rice in the Western Hemisphere and the fourth largest producer. Bananas and other fruits are also important export crops.

Forest Products

Ecuador produces several strategically important forest products. Among them are balsa wood, castilla rubber, kapok, mangrove bark, and palm oil, all derived from natural forests of the coastal region. Another essential product is cascarilla, from which quinine is extracted. Barbasco, a rotenone-bearing root, is found in the Oriente. Tagua nuts have constituted Ecuador's most important forest export product in point of value. Another outstanding product is toquilla straw from which the famous "Panama" hats are made.

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Agriculture IN THE Americas

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IN THIS ISSUE

November 1943

NAMES & NEWS

Mario A. Sol, President of El Salvador's *Mejoramiento Social,* S. A. (Social Betterment, Inc.) and close adviser to President Martinez in the socioeconomic field, is spending about 2 months in Washington and New York. One of the purposes of Mr. Sol's visit is to arrange for the purchase and shipment of machinery needed in connection with projects for low-cost housing and land distribution in El Salvador. *Mejoramiento Social* is an organization vitally concerned with planning for post-war development of the Salvadoran economy and the elevation of the Salvadoran standard of living. Mr. Sol will also arrange for the shipment of laboratory and other materials to the *Centro Nacional de Agronomía,* the agricultural experiment station in the San Andrés Valley.

Dr. Wilson Popenoe, Director of the recently established *Escuela Agrícola Panamericana,* at Zamorano, Honduras, reports that the first class, admitted to the school in August, comprised 73 members. This is nearly twice the number planned, but the enthusiasm for the school has been so great that the registrants could not be further limited.

Dr. Ross E. Moore, Assistant Director in charge of Latin American Relations, Office of Foreign Agricultural Relations, has gone to Quito, Ecuador, to attend the meeting of the Board of Directors of the Ecuadoran Development Corporation. While there he will also consult with the staff of the *Estación Experimental Agrícola del Ecuador.*

Dr. Earl N. Bressman, author, in collaboration with Vice President Wallace, of a widely used authoritative book entitled *Corn and Corn Growing,* and Director of the Inter-American Institute of Agricultural Sciences in Costa Rica, was a recent visitor in Washington.

The Institute is carrying on, among other projects, intensive experimentation in the development of new types of corn adapted for growing in the tropical Americas. Some of the most promising types have been found from among 79 varieties of Guatemalan corn made available to the Institute by Sr. General Roderico Anzueto, Secretary of Agriculture in the Guatemalan Government. Research in corn has been a lifelong work of Dr. Bressman.

Forestry Scholarships for Latin America

The University of Michigan is offering a scholarship, open to Latin American agronomists, engineers, and scientists interested in silviculture and the industrial applications of wood. The scholarship includes round-trip transportation, tuition, and a monthly allowance of $100 for maintenance over a period of 2 years. The course covers practical and theoretical study of forest conservation and timber cultivation, timbering methods, and numerous industrial uses of wood. Applications will be received up to December 1 and awards made about January 1.

Roselle Contract Signed

A contract has been signed in Cuba providing for experimental plantings of 2 acres of roselle at the Santiago de las Vegas Agricultural Experiment Station. The experiment will be under the immediate supervision of agencies of the United States Government and Dr. Julian Acuña of the Experiment Station staff, assisted by Dr. Julian Crane of the United States Department of Agriculture, now stationed at Habana for the purpose of conducting fiber research.

Agriculture IN THE *Americas*

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Pest Control Challenges the Americas

Inter-American cooperation in the control of agricultural pests is particularly important during the present emergency. The progress already made in this direction augurs well for future efforts.

by P. N. ANNAND

The countries of the Americas, extending from the frozen regions of the North to those of the South, from sea level to some of the greatest land elevations, have agricultural problems as diversified as the agriculture of the world. American crops range from those harvested from cold-hardy plants maturing in a short season to those gathered from plants that produce throughout the year. Great as are these contrasts, however, there are large areas in many of our countries where climatic and ecological conditions are so similar in the contrasting seasons of the North and the South that the same crops are an essential part of their agriculture. Both north and south of the Equator vast areas are used to produce wheat, corn, cotton, and livestock. Orchards of the same deciduous fruits, groves of citrus, and vineyards are found in many of the countries. Potatoes, sugar beets, and most of our vegetables are a part of the agricultural produce in many areas of the Hemisphere. Many important crops have the same origin. Agriculture in the Americas has much in common.

All our countries have in general a similar history of settlement and agricultural development, and we have all depended on finding markets in other countries for our crops and other products and must continue to do so. All have many problems of pest control, creating a common interest, and every reason exists for a high development of inter-American cooperation in the control of agricultural pests.

Insect pests have no respect for man-made lines or customs. Unless prevented by natural barriers, they tend to spread into all areas where conditions are favorable for their development. The effort of one country to control insects that cause serious losses may be more or less offset if comparable control measures are not applied by its neighbors. Hence, international cooperation is needed for effective control of pests and protection for agriculture. Countries of the Americas have taken the lead in cooperative pest control and have demonstrated the benefits that may be obtained.

War Stresses Need for Pest Control

The pests that annoy man and waste his crops and stores may be classified roughly as cosmopolitan, introduced, and native. No one knows when the first-mentioned began their depredations, but since the early days of sailing vessels they have come to all human habitations. They have been so generally distributed that they have been ignored when programs of international cooperation for pest control were being considered.

The wisdom of ignoring these pests may now be questioned, particularly since the war has placed such emphasis on conserving and protecting our resources. Many of these cosmopolitan, well-known insect pests may destroy large quantities of stored or processed foods, fibers, and other supplies essential to the war effort and to plans for peacetime reconstruction. Not only that, but the fortunes of war and military activities essential to the protection of our freedoms have brought new requirements for many kinds of materials and chemicals and have curtailed supplies of some of the standard devices and materials used to control these pests.

Among the introduced pests may be mentioned the San José scale, *Aspidiotus perniciosus* Comst., a native of China, which occurs in most of those countries of the Americas in which its favorite fruit-tree hosts are grown. Numerous other scale insects have been widely distributed with nursery stock and now occur in agricultural regions

Laboratory at Mexico City, wherein the Governments of Mexico and the United States are carrying on cooperative studies.

in many parts of the Americas. Examples of these are the citrus-tree pests, such as the Florida red scale, *Chrysomphalus aonidum* (L.); the California red scale, *Aonidiella aurantii* (Mask.); and the purple scale, *Lepidosaphes beckii* (Newm.).

The cabbage butterfly, *Pieris rapae* (L.), native to Europe, is a familar pest in certain of our countries and is often an important factor in the production of crops related to the mustard family. The codling moth, or apple worm, *Carpocapsa pomonella* (L.), is so well known in many American countries that we often fail to think of it as an introduced pest. The horn fly, *Haematobia irritans* (L.), a native of Europe, is a well-known pest of cattle in certain areas of the Americas. The pink bollworm, *Pectinophora gossypiella* (Saund.), is an important cotton pest in a number of American countries. Problems of controlling all these pests and preventing the losses that they are causing or may cause confront agriculturists throughout the Americas, irrespective of political boundaries.

Certain of the introduced pests common in many of our countries can be partially controlled by the use of their insect enemies. While the benefits from these natural aids are not often quickly attained, it is especially desirable that we assist one another in promoting wider distribution of beneficial insects now that the use of standard materials must be curtailed because of the war.

Some of the insect pests native to the Western Hemisphere occur in many of our countries. Others are known to occupy only limited areas. For many, only fragmentary information is available as to their distribution and actual importance. At least a few are known to migrate long distances and on occasions cause serious crop losses in many sections, irrespective of man-made boundary lines. Various kinds of grasshoppers are in this category. While the habits of the grasshoppers important to the southern countries differ strikingly from those of their counterparts in the North Temperate Zone, the application of control procedures may often be made more effective through cooperative efforts.

One native insect that frequently causes losses in the North and South Temperate Zones presents an entomological problem peculiar to the Americas and one that has long challenged the ingenuity of American entomologists. This species, the cotton leafworm, *Alabama argillacea* (Hbn.), appears to live continuously in the more central parts of the Americas, but with the seasons it moves northward and southward in the adult, or moth, stage under its own power and becomes destructive in regions where it cannot persist throughout the year.

Many other important native pests present problems of control that need cooperative study, but to attempt to discuss these problems with the limited information available would be futile. Only a very few of these pests have yet been studied. The important thing, however, is that the need for cooperative effort in such research has been recognized. The laboratory at Mexico City, wherein the Governments of Mexico and the United States are carrying on cooperatively studies, begun some 15 years ago, on various species of fruitflies of the genus *Anastrepha*, is an example of the value of cooperative effort in finding ways to control important insect pests.

Cooperative Appraisal Important

Before steps can be taken to control the insect pests of the Americas, cooperation is needed in appraising their relative importance. Of 49 forms listed as individual pests in a compilation made by specialists of the Bureau of Entomology and Plant Quarantine some years ago, when an effort was being made to appraise the losses caused by insects to agriculture in the United States, at least 13 were known to occur in 5 or more other countries of the Americas.

In order to appraise the importance and significance of these insect pests, however, one should know (1) how important to the agriculture of other countries of the Americas are the 13 species the control of which is of special importance to crop production in the United States, (2) where they occur, and (3) what is being done to control them there. Cooperative study to gather such information for all countries is a line of endeavor that should be expanded. The data thus assembled would form a sound basis for joint action in insect control.

Various opinions have been expressed by specialists in insect identification as to the approximate number of insect species that exist in the world but have not yet been described. The guess most frequently given is

that over 90 percent of all insect species are still undescribed. New species, according to present estimates, are being described at the rate of 10,000 to 12,000 a year. Using the conservative estimate that more than 625,000 kinds of insects have already been described, one may therefore conclude that there are more than 6,000,000 kinds of insects in the world. Each of these can be distinguished only after many of its characters have been examined and appraised.

One is not surprised, therefore, that the classification and identification of insects is a field of high specialization requiring painstaking, persistent endeavor. The extent and complexity of this field make it necessary for students to depend on the work of others and to have access to specimens studied by other workers. This means, of course, that extensive collections of insects must be established and maintained and that particular care must be used in formulating criteria for specific identification and in preserving standards for comparison.

The present war has emphasized the need for maintaining reference collections in the Western Hemisphere, and the urgency of extending and perfecting practices and procedures in their use so that we in the Americas can ourselves supply this basic step (accurate pest identification) in the formulation and expansion of policies in the general field of pest control. The wisdom of this has been recognized, and in recent years there has been increased effort in the field of insect identification.

Insecticide Cooperation

Recent study to develop and utilize certain plants containing fish poisons and long known to have insecticidal properties is an important and striking example of the kind of cooperation our countries are promoting in the field of pest control. Painstaking, highly technical chemical investigations of these plants have revealed the active insecticidal ingredients, rotenone and rotenoids, and have furnished a basis for standardizing the plant material. Agriculturists are making extended use of this discovery, and a large new field has been opened in the insecticide industry. Both agriculturists and the insecticide industry, however, are dependent on supplies of raw material that come only from limited sections of the world, some of these being certain areas in the Americas. The protection and development of these sources is of interest and concern to all the Americas and has been so recognized in the development of over-all cooperative relations.

So important is the war need for material and equipment that procedures to control and conserve supplies have been established in the United States. Some of the standard insecticides may not be available in sufficient quantities to permit their unrestricted use to protect food and fiber crops needed in the expanded production program. Efforts are therefore being made to reduce dosages and to apply the materials at a time and in a manner to secure their greatest effectiveness. In the distribution of materials to using centers care is exercised to avoid having surpluses in some areas and shortages in others. With it all, control of one kind or another has been established on imports and exports of insecticidal materials. One is gratified that, notwithstanding the shortage in supplies of some insecticides, the quantity of two such important ones as lead arsenate and calcium arsenate made available to cooperating countries in the Americas for use during 1942 and 1943 crop seasons has been more than double that of the 2 preceding years.

Regulatory Quarantine Measures

When the countries of the Western Hemisphere were being settled and developed, the importance of excluding plants infested with destructive pests was not fully recognized. As the needs for pest control became more apparent, and as experience disclosed that many insects and diseases of little or no significance in their native habitats caused excessive losses and additional production costs when they became established in new areas, the picture changed.

Thirty-seven of the government agencies of the Americas, recognizing the importance of preventing the introduction of new pests and the general distribution of those that occur in limited areas, have enacted laws regulating the importation or movement of commodities that may carry pests. The time when such actions were taken ranges from 1897 until as late as 1937. These laws and regulations and the procedures carried out

Pink bollworm. This tiny moth can move long distances with wind currents. The worm lives within the cottonseed, destroying and damaging the cotton lint.

under them differ greatly, and naturally so, but they all have the same fundamental objectives.

Experience gained since plant quarantines and regulatory measures have become an intimate part of pest-control programs has shown and emphasized the value of and need for research. Many problems arise concerning which adequate information is lacking. One of the important needs is to find ways of so treating products that the pest risk is removed. Research has developed effective treatments and has also emphasized that proper application of the treatment is important. Experience has shown that this requires competent supervision.

Research has also demonstrated that procedures developed for one kind of pest or commodity may not be effective on another related pest or even on the same pest when it infests different commodities or where the treatment is applied under different conditions. Striking and important as the research developments have been, much more needs to be done before the acceptance of treatments can have wide and general adoption as a basis for exchange of plants and plant products that may carry important pests.

The effective enforcement of regulatory measures to prevent the introduction and dissemination of pests depends to a very large extent on a thorough understanding as to the areas where injurious pests may occur. To be fully useful, such information must be current and based on thorough and frequent inspections.

Analysis of adequate information on the status and occurrence of pests may often furnish a convincing reason that the exchange of commodities can be extended without pest risk. Such information is of special value in considering problems confronting many of the countries of the Americas, particularly those which include vast areas and a wide range of climatic and ecological conditions. To conclude without thorough investigation that a pest is generally and widely distributed throughout such areas is not scientific and may lead to undue restrictions on the movement of products produced in uninfested sections. Full understanding of all facts and the development of cooperative relations to assure free exchange of current information regarding the occurrence and status of the pests should be helpful in developing scientifically sound regulations, the purpose of which is to protect agriculture in uninfested sections from new pests.

Mexican fruitfly. Its eggs are laid in the skin of many kinds of fruit. The maggots destroy the pulp.

Citrus blackfly. This native of the Orient sucks juices of leaves and fruit, causing a black mold, which reduces yields. It is controlled by a parasite brought from its native home.

Governmental Insect-Control Programs

For many years certain countries of the Americas have cooperated in carrying out programs directly supported by public funds for the control of insect pests. Information on all these is not available, and reference will be made to only a few in which the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture has participated.

Active cooperation in the actual application of control work is naturally most effective when the countries are contiguous and where climatic and ecological conditions are similar. That this is not always essential, however, has been demonstrated by the effective results secured through the cooperative efforts of the Governments of Cuba and the United States to control the citrus blackfly, *Aleurocanthus woglumi* Ashby, by the use of natural enemies.

Cooperation between Mexico and the United States in control programs has included a number of important pests. The cooperation extended to the United States in its effort to control and prevent the spread of the Mexican fruitfly, *Anastrepha ludens* (Loew), is noteworthy and has already been mentioned. In recent years these cooperative undertakings have included coordinated efforts to find facts on the occurrence and status of other pests. One of these is an introduced beetle, *Hypera brunneipennis* (Boh.), which attacks various clovers and other legumes. Another is a virus disease of the peach, known as peach mosaic, against which the Bureau of Entomology and Plant Quarantine of the United States and cooperating State agencies are carrying out a concerted effort to suppress and prevent its spread. There has also been some cooperation in studies on black stem rust, *Puccinia graminis*, an important disease of small grains. Strains of wheat which have some immunity to this disease in the United States have been made available for tests under Mexican conditions.

The pest which has been the subject of cooperation between Mexico and the United States over the longest period, however, is one of immense importance to both countries, namely, the pink bollworm of cotton, *Pectinophora gossypiella* (Saund.). Governmental cooperation on this pest began in 1917. From the small beginning, concerned largely with fact findings in research and surveys to determine distribution, it has developed into a program under which the two countries are working together as closely as do agencies of adjoining States in the United States. The discovery of infestations of this pest in the Lower Rio Grande Valley on both sides of the international boundary line prompted both Governments to expand and solidify their efforts with the hope of suppressing these infestations of the insect and bringing about more effective control of all others. This undertaking shows how nations of the Americas can work together to achieve a common goal and is an outstanding example of international cooperation in plant-pest control.

Promise for the Future

The foregoing discussion does not pretend to suggest all the ways in which cooperation in pest control may be extended and made more valuable. Greater than anything that has yet been done and greater than anything that any of us have dreamed of is the promise for the future. Present emergencies are teaching us to work together and are showing us that as we work together our efforts will become better coordinated and more effective. We need no prophetic flights of the imagination to reach the conclusion that what we have achieved is only the beginning of inter-American cooperation in pest control.

Reading
ABOUT THE AMERICAS

The Story of the Americas, by Leland Dewitt Baldwin; 720 pp.; Simon & Schuster, New York, 1943. Relates the first 450 years of recorded history of the Western Hemisphere—discovery, conquest, colonial times, modern age. Well written. Good index.

The International Relations of Latin America, by Ross N. Berkes; 83 pp.; (mimeographed), the University of Southern California, Los Angeles, 1942. This is the syllabus for the first semester of a course. Good introductions, outlines, and bibliographies.

El costo de la vida obrera en América, by Ana Mekler; 139 pp. (mimeographed); Pan American Union, Washington, D. C., 1943. Gives living cost indices for 20 American republics, résumés, averages of exchange rates, and bibliographies.

Guide to the Inter-American Cultural Programs of Non-Government Agencies in the United States, compiled by the Office of the Coordinator of Inter-American Affairs; 181 pp. (mimeographed); Washington, D. C., 1943. Gives name, address, date established, membership, source of finds, purpose, and inter-American activities of organizations listed. Keyed as to primary functions and categories.

The Inter-American Movement, an Outline, compiled by the Office of the Coordinator of Inter-American Affairs; 14 pp. (processed); Washington, D. C., 1942. Lists important steps and agencies for the promotion of inter-American agencies.

Nordeste, by Gilberto Freyre; 267 pp.; Livraria José Olympio, Recife, Brasil, 1937. Traces the influence of sugarcane growing on the life and country of Northeastern Brazil, by one of Latin America's outstanding sociologists.

Schools of Social Work in Latin America, by Robert C. Jones; 21 pp. (mimeographed); Pan American Union, Washington, D. C., 1943. After general introduction, lists and describes social schools in 12 Latin American republics.

Say It In Spanish, by Sherman W. Brown; 304 pp.; Harper & Brothers, New York, 1943. Sentences and conversations, with vocabulary; beyond the elementary level.

(Concluded on page 216)

Costa Rican Dairyland

Natural conditions in Costa Rica favor cattle raising, and the people are fully aware of the dietary value of dairy products. With the general adoption of modern methods and techniques, the dairy industry promises to become a leader in Central America.

by R. E. HODGSON

Costa Ricans of all walks of life hold the lowly cow in high esteem. This is demonstrated in various ways. Many wealthy people own farms and good herds of dairy cattle. Business and professional men seem ambitious to become breeders of fine cattle. Artists and painters, portraying picturesque rural Costa Rica, invariably include the cow in their scenes. Many laborers, countrymen, and poor folk have a desire to possess a dairy herd or at least a family cow.

Interest in the cow has been long standing and comes from the knowledge that she has made a significant contribution to society by bringing about better living conditions.

The cow is appreciated because she produces oxen, the omnipresent source of draft power; beef, the mainstay in the daily diet; and milk, the health-giving fluid of universal favor. Milk is now receiving the greatest attention, because its importance in the diet of young and old alike is becoming more fully appreciated by people of all classes. Milk and milk products are so popular in this progressive little country that the present dairy industry is unable to supply the demand. The cost of milk is relatively high at present, however, and this prevents its maximum use by a large segment of the population—particularly families most in need of this vital food.

The present domestic production of milk in Costa Rica is estimated to be only enough for an average per capita consumption of 2 or 3 ounces a day. Each year, however, substantial quantities of dairy products are imported to supplement domestic production. Thus in 1941, the last year for normal shipping, imports amounted to about 354,000 pounds of dry milk, 553,000 of evaporated milk, 371,000 of condensed milk, 53,000 of cheese, and 6,000 pounds of butter.

The demand for dairy products has recently become so great that it is causing a major movement by landowners into the dairy business. Conditions are such that this country will be able to supply its own needs insofar as dairy products are concerned. By far the most desirable areas for dairy production are in the highlands, particularly the slopes of the Irazú, Turrialba, Barba, and Poas Volcanoes. The highlands are especially favorable for dairy farming, because the temperature is moderate and the improved breeds of dairy cattle adapt themselves well; the water supply is abundant and the water remains cool; the rainfall is generally adequate for year-round pasture production; the pastures comprise fine-leafed, palatable, nutritious grasses and clovers; the cattle-fever tick is not present; and the areas are adjacent and accessible to the population centers, thus making for ease in marketing the products of the dairy.

Dairy farming is especially suitable for the highland areas, because it keeps the major part of the land in permanent pasture and other types of forage crops that retard soil erosion. The forage crops, as well as corn and small grains, can be "marketed" efficiently on the home farm by feeding them to good dairy cattle.

The central plateau area around San José and Cartago and the adjacent valleys are also suitable for dairy farming. The lowlands are less adaptable to intensive dairying, although considerable milk is produced in the Department of Guanacaste.

The highlands and central plateau could support a much larger cow population. By adjusting the farming program to produce the maximum quantity of pasturage and to produce other roughage and grain feeds for supplementing the pastures during the dry season, a more

Pine Manor Melody Master, purebred Guernsey bull representative of the type of herd sire Costa Ricans have introduced to improve their cattle.

A good dairy herd in the central plateau near the city of Cartago, an excellent demonstration that the improved breeds can maintain themselves and produce liberally under favorable conditions of feeding and management in this area.

abundant and uniform feed supply could be obtained. Since certain of the lowland areas are especially suited to the raising of corn, this grain could be grown extensively in these areas and shipped to the highland dairy sections for feeding for intensive milk production.

The original cattle introduced into Costa Rica were of the Andalusian type imported by the early Spanish colonists. After years of adaptation and natural selection the Costa Rican Criollo was developed. The Criollo was a general-purpose animal and did not suit the needs of the highland farmers who desired a superior type of dairy cow. The wealthy landowners and breeders of livestock saw something better in the improved breeds of European-type dairy cattle, and they began to import bulls of these breeds, and occasionally cows, for the purpose of improving the native stock and of establishing improved breeds on their farms. Importations began in the early years of the present century and have continued more or less regularly to the present time. The Costa Rican Government lent a benevolent hand in making these importations possible.

Purebred bulls and cows of the Ayrshire, Brown Swiss, Guernsey, Holstein-Friesian, and Jersey breeds have been imported, largely from the United States, England, and the Channel Islands. They adapted themselves well to conditions in the plateau and highland regions. Consequently, they have increased in numbers and have caused a marked improvement in the native cattle in these areas. Some 80 percent of the dairy cattle in these areas are descendants of imported dairy breeds. Jerseys and Guernseys have proved the most popular, and their numbers outrank by far those of the other breeds.

Breeders have exercised considerable skill in the selection of their imported stock, selections having been made on the basis of production records and type. As a result numerous herds now contain some of the best dairy breeding available, particularly of Jerseys and Guernseys. Upon visiting herds of dairy cattle in this country, one frequently observes cows of improved breeds that are of good type and that produce liberal quantities of milk. They are proving an excellent source of seed stock for the present expanding dairy industry within the country. Indeed, dairymen in adjacent Central American countries may look to Costa Rican breeders for stock with which to improve their cattle. Within recent years Costa Rican breeders have supplied young bulls for herd sires to several neighboring countries.

Dairy-cattle breeding has reached a point in Costa Rica where more scientific methods of measuring the producing and transmitting abilities of breeding animals are needed to ensure continued progress toward higher production. Breeders have realized this and have kept their purebred animals registered in the breed-association herdbooks in the United States. This practice does not fulfill their needs, however. A herd register is needed in Costa Rica, in order that breeders can record the identity and purity of their animals. More important is the need of a national herd-improvement association that would provide facilities for testing and recording the producing abilities of breeding animals. Real herd improvement can be brought about most rapidly by mating animals that have the necessary genetic qualities to transmit high-producing ability to a large percentage of their offspring, and the only way to locate this kind of breeding animal is to test the female progeny for production. The importance of a herd-testing program was emphasized in an article in the September 1943 issue of this publication. The newly created Department of Agriculture of Costa Rica will perform a real service to the breeders of

Dairy cattle grazing on lush nutritious pasture in the shadow of Turrialba Volcano. Here conditions are ideal for the economical production of high-quality dairy products.

dairy eattle, and to the industry as a whole, by working with the breeders in developing herd-improvement programs.

For more than a deeade, Costa Riea has held an *Exposición de Ganaderos*. This exposition has been of inestimable value in teaehing breeders and farmers the merits of good livestock. It has also served to inform the publie about the importanee of good livestoek in the national eeonomy. The *Asociación Nacional de Ganaderos* has also proved its merit in promoting the interests of the livestoek and dairy farmer. The organization of assoeiations of purebred-eattle breeders, particularly for the Jersey and Guernsey breeds, is a program worthy of eonsideration.

The produetion of milk is earried on under reasonable sanitary eonditions on the farms, partieularly in the higher altitudes. The dairymen for the most part take pride not only in the quality of their eattle but also in the quality of the milk they produee. Where eonditions are not so desirable, they eould easily be improved without exeessive expense, and progress is being made in this direetion. The abundant supply of eool running water available on many farms in the highlands for eooling purposes is a great asset to the produetion of high-quality milk. In the lowlands, milk must be eooled by refrigeration, and this is being done to an increasing extent.

Marketing and distribution methods have not kept paee with the development of dairy herds or with the development of sanitary methods of produeing milk on the better farms. Under the sponsorship of the *Consejo Nacional de Nutrición*, the *Departamento de Agricultura*, the *Departamento de Salubridad Pública y Protección Social*, and various other groups, however, an active movement is under way to develop a modern, eooperative, fluid-milk proeessing and distributing system for San José. The realization of sueh a plant as a eooperative farmer enterprise will go a long way toward providing a safe and wholesome milk supply for the eity.

A 600-pound block of high-quality butter ready to be worked into pound prints and marketed. Butter of this quality is produced in the volcano highlands.

The Costa Rican is very fond of eheese and perhaps upward of 50 pereent of the national milk produetion is marketed in this form. Praetieally all the eheese is made on the farm from freshly produeed milk. As in other tropical Ameriean countries, the predominating type of eheese is *queso blanco*, or white eheese. It is made from whole milk, part skim milk, or all skim milk and varies in texture and quality, depending on the eonditions under whieh it is made. It is heavily salted and is best when eonsumed fresh. Large quantities of this type of eheese are made in the Guanaeaste area.

As with the quality of their eattle, progressive dairymen have not been satisfied with the quality of their eheese. As a result, several types of eured eheese are to be found, sueh as Camembert of whieh there are many variations, for eaeh progressive dairyman has developed his own brand. This eheese is made from elean whole milk, is of good quality, and improves as it eures in storage.

Cured Cheddar eheese of good quality is also found in the markets in Costa Riea. At least one large farm is produeing this type of eheese. It is a very desirable type for the eountry, beeause it is easy to make in small faetories, keeps well, and improves on euring.

Butter making does not rank in importanee with the eheese or market-milk industries, although eonsiderable farm butter is made. Conditions for making butter are ideal in the highlands, where many Jersey herds are to be found. The butter as made on the farm is generally of good quality, but it is a perishable product and subjeet to deterioration during marketing. Although Costa Riea and the neighboring eountries offer a good potential market for butter, the market-milk and eheese industries probably should first be more fully developed.

The Costa Rican, not unlike his "Amerieano" neighbor to the north, loves iee eream. Praetieally all the iee eream and related produets manufaetured are made by small eoncerns, generally without the aid of modern equipment and facilities. The iee-eream market is growing, however, and will be stimulated as manufaeturers eontinue to modernize their methods and equipment.

Costa Rican dairymen need have no fear of a poor outlet for good-quality dairy produets, for a market exists in their own eountry. All that is needed is to stimulate and develop this market by inereasing the availability of wholesome, safe dairy produets at fair priees. The consumer, already aware of the food value of dairy produets, will utilize inereasing quantities. Indeed, Costa Rican dairymen may reasonably expeet that some of the adjaeent eountries will eventually provide markets for any surplus dairy products. Thus, their eheese and butter surpluses, like their good dairy eattle, someday may be sought by friendly neighbors.

Ecuador's Balsa Goes to War

Prior to the war the general public knew little of Ecuador's balsa wood. Because of its use in the construction of "mosquito" bombers and naval life rafts, it now makes the headlines.

by FRANCISCO BANDA C.

When the Spanish *conquistadores* arrived in the tropical regions of the New World early in the sixteenth century, they found the natives using rafts made of very light-weight logs. The Spanish word for raft is balsa, a name that soon came to be applied to the trees from which these logs were cut.

The balsa tree is indigenous to tropical America and produces one of the most important of the light-weight woods. Ecuador is the chief source of this strategic material and at present controls about 95 percent of the world production. None of the various species of balsa trees grow naturally in the United States.

The weight of balsa wood varies with the age of the tree; the lightest weighs only about half as much as cork. The strength of the wood is approximately half that of spruce; its modulus of rupture equals 2,100 pounds per square inch, and its crushing strength, 2,150 pounds per square inch.

Except for the wild papaya, a young balsa tree grows faster than any other form of jungle vegetation. Within a year, the tree is about 12 feet high and from 2 to 2.5 inches in diameter. Maturity and marketability are reached in from 6 to 8 years, when the trees are readily felled and processed.

Uses of Balsa Wood

For industrial purposes, wood from young trees is preferred, because it is lighter than that from old trees. When 6 or 8 years old, the weight of the wood averages from 5 to 10 pounds per cubic foot. The color of balsa lumber is sometimes pinkish white, pale reddish, or sometimes brownish, with a rather silky luster.

Balsa wood is famous for its insulating properties, due to its cellular structure, and Ecuadoran balsa is the best known variety. It is used in many ways: For life preservers, swimming belts, pick-up buoys, submarine-mine floats, pontoons, airplane construction, loud speakers for radios, surfboards, insulation for refrigerator equipment, sound-proof construction, and children's toys. It has a future also as a new type of "fill" for an extremely light tennis racket. Air transportation will bring balsa in as an ideal packing wood.

An important industrial use of balsa wood is based on its insulating properties. As an insulator against heat and cold, it is utilized in auto-truck bodies, holds of ships, and in refrigerators. For such uses, it is ideal, because balsa is odorless and offers resistance to the absorption of moisture.

Balsa wood is employed by airplane manufacturers for fairings in planes. Because of extreme lightness and strength, combined with sound- and vibration-absorbing qualities, the inside walls in the passenger compartments of commercial planes are made of this wood.

In addition to its strength, balsa is smooth, soft-surfaced, highly resilient, and compact. A major use based on these qualities is as protective packing against the

Balsa tree, 5 years old.

shocks and jars of shipment. Balsa pads are used in the packing of furniture, radios, sensitive instruments, and fragile articles, such as ceramics and other goods. It is also used in factories as a cushion to absorb the vibration of machinery.

During the first World War, the United States Navy equipped naval transports with life rafts and life preservers of balsa, and mines were floated on balsa wood. At the present time, the Navy is using balsa life floats capable of supporting several persons.

Before the present war, toy manufacturers and manual training schools used balsa wood for cutting into model airplanes, toys, and other models. Under orders of the War Production Board, balsa lumber may now be utilized only for the manufacture of life preservers, life floats, and other buoyant apparatus; for airplane construction; and for other specified purposes necessary to the war effort.

Summing up, the uses for balsa fall into three major groups: (1) Aircraft construction, (2) buoyancy apparatus, and (3) model airplanes, toys, and the like. Broadly speaking, there is a specific grade demanded by each of these groups. Balsa, destined for aircraft design, must pass more stringent inspection than wood going into life-saving equipment, and the model airplane can be satisfied with air-dried wood heavier than 12 pounds, scraps, shorts, and rejects.

Producing Regions

Ecuador owes its leading position in the balsa industry to natural facilities and inexpensive labor for collecting the wood and shipping it. Many new methods of inspecting, grading, and handling the wood have, however, been introduced, largely through the efforts of the United States. These are reflected in the increased output for 1942, which was estimated at 24,000,000 board feet as compared with 16,500,000 in 1941.

Balsa trees line the banks of the Guayas, Babahoyo, and Daule Rivers and their tributaries as well as the banks of the Río Verde, Esmeraldas, Chone, etc., which penetrate the hinterland of the country. The "Santo Domingo de los Colorados" region, in the Province of Pichincha, has some virgin forests of balsa that have not yet been touched.

The trees occur most frequently in the coastal regions of Ecuador, where there is plenty of moisture. They are usually near the mountains, however, since proper drainage is also essential. Although balsa is found in virgin forests, the tree is most abundant as a second growth in clearings made either by nature or by cultivation. Natural seeding produces such a large number of young plants that weeds are suggested; hence, the balsa is known as a "weed" tree. Because of this growth, the existing volume of balsa is difficult to estimate accurately. Furthermore, the Government of Ecuador passed a law in 1937 that requires the planting of two balsa saplings for each tree cut for commercial purposes.

The United States, in fact the whole world, depends for balsa upon the imports from tropical America, mainly Ecuador, which supplied an average of 99 percent of the balsa needs of the United States and Great Britain during the 1935–1941 period. Other American countries, such as Costa Rica, Guatemala, Nicaragua, Colombia, Venezuela, and Panama have provided negligible quantities only.

Cutting and Milling

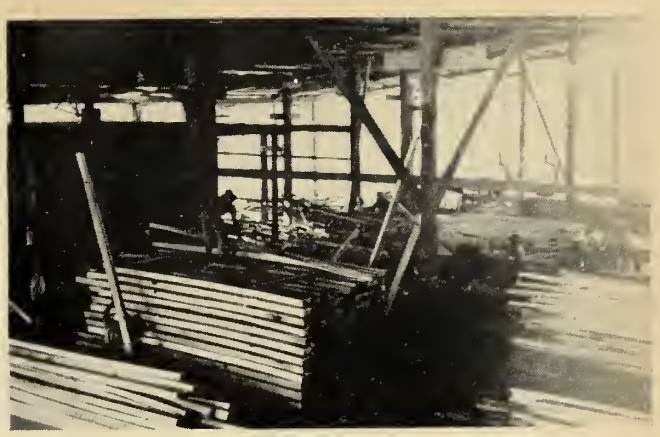
Balsa logs are cut only a few weeks in advance of milling or of shipping, since exposure results in deterioration.

Felled balsa trees ready to have the bark removed.

Rolling balsa logs into a stream for rafting.

A thorough drying is also necessary. The logs are cut into boards and planks and then dried and graded. Some of the leading lumbermen kiln-dry the balsa wood immediately after cutting, thus minimizing any chance of decay.

Considerable progress has been made by the United States Government in introducing an orderly system of grading the lumber on the spot in the sawmills of Ecuador, with the result that the wood can now be loaded on board ship at Guayaquil and shipped direct to its destination without having to face the many delays formerly entailed in a second sorting, with rejects, at the point of final processing.



Balsa wood being air-dried.

Labor

In the coastal region of Ecuador, comprising an area of 30,000 square miles, from sea level to an elevation of 2,500 feet, precisely where balsa wood and rubber are available, there are estimated to be 550,000 inhabitants, or an average of 18 persons per square mile. Compared with other low-lying regions of the moist tropics of South America, this is a rather high density of population and probably could furnish a fair quota of agricultural laborers.

During March, April, and May, however, when the chief crops of the region—cacao, bananas, sugar, rice—are being harvested, there is a shortage of labor. Enterprises interested in balsa wood find great competition for plantation workers, not to mention the severe competition which the tapping of rubber and the gathering of cinchona bark are offering to all the agricultural industries.

Although certain Indian tribes and other population groups offer possibilities for recruiting labor, much field work would be required to secure any significant additional force for balsa. If exports of this highly useful wood are to be materially increased for the United Nations war effort, Ecuador must first solve its labor problem.

Loading lumber on balsa raft at the mill.

Bundled balsa stowed on deck and hatch of ship.

Mexico to Develop Guano Industry

The agriculture of Mexico holds an important place in the economy of the country. A source of fertilizer from which the farmers can readily draw needed supplies holds high promise for the future.

by LEO J. SCHABEN

Peru long has been the world's largest producer of guano, one of the best natural nitrogen fertilizers. Now Mexico is to develop a guano industry by methods provided in a decree recently promulgated by the President of that country. This decree, dated June 17, 1943, sets aside as guano zones certain areas of the Republic extending from the coast of the northern Territory of Lower California all the way to the port of Acapulco in the State of Guerrero, where guano-producing birds are to be protected and their numbers increased.

A population of from 20,000,000 to 30,000,000 guano birds, with an annual production of from 200,000 to 300,000 tons of fertilizer, has been set as the goal. A special guano-development corporation, functioning under the protection of the Mexican Government, has been set up for the accomplishment of that objective. That organization will be the only one authorized to exploit the Mexican guano deposits.

The aim of the Mexican Government is not only to develop a source of supply of low-cost fertilizer for its own farmers but to build up as well an export trade in that product. The successful development of the project would unquestionably be of far-reaching significance not only to the future of Mexican agriculture but also to the national economy of the nation. Even in Peru the peak production of guano has not exceeded 170,000 tons in any one of the past 33 years.

Typical native farmhouse.

In announcing the decree of June 17, President Manuel Ávila Camacho stated: "The Government of the United Mexican States has endeavored to improve national agriculture by constructing irrigation works, supplying working materials, opening credit to farmers, etc., but up to the present time it has not sought a systematic and technical solution of a fundamental problem such as the fertilization of the soil which is necessary in order that our country may occupy its corresponding place among the agricultural countries of the world.

"To date, the general system of cultivation is extensive. This requires large expenditures to supply sufficient irrigation to the continuously growing agricultural areas which do not compensate the farmers with yields corresponding to their efforts. It has become necessary to intensify agricultural production. To this end a more effective use of fertilizers should be encouraged and the farmers taught the proper technique for its use.

"To date, for various reasons, our farmers use almost no fertilizers, the majority of them using materials that are not exactly fertilizers but simply substitutes to improve the soil. Teaching the farmer proper agricultural technique is not sufficient. He must be supplied with a fertilizer that meets his needs and that can be purchased within his means.

"For these reasons the Federal Government has considered it necessary to find an immediate solution to the above problem. Bearing in mind the experience of the Republic of Peru, and also that the conditions of our Republic are favorable for such a project, it is considered wise not to delay the formation of guano deposits so that in the shortest time possible this product can be available in sufficient quantities to meet the agricultural needs of the country.

"Up to the present time, guano birds have not been given the attention due to them and no efforts have been made to concentrate the birds in any definite zone. Instead, they have been persecuted and destroyed without allowing them to remain permanently in any one place to form guano deposits adequate for exploitation. It is distressing to note that large quantities of guano fertilizer

Courtesy of Pan American Union

A farmer with herd of cattle near Puebla.

dispersed on our coasts are washed by rains into the sea, resulting in huge losses to public wealth.

"It is therefore necessary to take energetic measures to prevent further losses. With this end in view, the undue exploitation of the valuable guano birds and their eggs by persons who are not cognizant of the benefits derived from them shall be prohibited.

"In order that guano deposits may develop, it has been considered advisable to constitute an organization which shall exercise technical control over the production of guano. . . . The proposed organization shall not form part of the Public Administration but it will operate under the protection and with the intervention of the Government in order that the guano industry may be developed to the satisfaction of public interests . . . thus fulfilling the urgent national need for a low-cost fertilizer."

The decree of June 17, 1943, specifies the following areas as guano zones: The coasts of Lower California, the States of Sonora, Nayarit, Jalisco, Colima, Michoacán, and Guerrero, up to the port of Acapulco, and all the islands and territories adjacent to those coasts. These zones, together with bat guano deposits existing anywhere in Mexico, are placed under the general supervision of the "Comisión de Fomento Minero," a branch of the Mexican Ministry of National Economy.

Responsibility for the actual development of a program for the exploitation and extensive use of guano in Mexican agriculture is delegated to an organization to be set up by the "Nacional Financiera, S. A.," a national credit institution. The Federal Government, however, through its Ministry of National Economy, reserves to itself the exclusive right to issue the measures deemed necessary and proposed by the above-mentioned agencies to carry out the project for which the organization is formed.

The capital of the organization is to consist of two kinds of stocks, Series "A" constituting 51 percent of the total and Series "B," 49 percent. The stock of Series "A" will be subscribed to exclusively by the Nacional Financiera and cannot be transferred except to the Federal Government. The stock of Series "B," on the other hand, can be subscribed to by private individuals.

Series "B" stock will pay a fixed and accumulative dividend of 8 percent per annum, guaranteed by the Nacional Financiera. Should any excess profit remain after this fixed dividend has been paid, it will be credited to Series "A" stock up to 8 percent per annum. Should a further excess profit remain, an additional payment up to 8 percent will be credited to Series "B" stock, but such special dividends will not be fixed or accumulative. Should there still remain a further profit, it will be credited to Series "A" stock.

The Board of Directors of the organization is made up of five officers and their substitutes, each of whom must be a stockholder. Series "A" stockholders are entitled to two members on the Board, one of whom is designated by the "Comisión de Fomento." Series "B" stockholders are entitled to three members on the Board. The decisions of the Board can be vetoed by any of the Directors designated by Series "A" stockholders only when such

Courtesy of Pan American Union

Vegetable growing in the State of Coahuila.

Courtesy of Pan American Union

Field of sugarcane, State of Sinaloa.

Courtesy of Pan American Union

Corn and chili peppers, staple crops of Mexico.

decisions deal with matters relating to (1) the exportation of guano before local needs have been met; (2) credit negotiations abroad; and (3) the sale or mortgage of real or personal property of the organization.

The decree authorizes the "Comisión de Fomento Minero" to enter into a 30-year contract with the organization for the exploitation of guano zones and bat guano deposits. The organization must sell guano of the same quality throughout the Republic at a uniform price. Upon termination of the contract all property acquired by the organization is to become the property of the "Comisión de Fomento Minero."

The decree also authorizes the organization to pay the "Comisión de Fomento Minero" a royalty of 5 percent for all guano sold in the country and 10 percent for all guano that is exported. Such royalties, however, are to be paid direct to the "Nacional Financiera, S. A." and are to be retained by that agency as a guaranty for the payment of the fixed and accumulative dividends on Series "B" stocks above mentioned. The specified royalties will actually be paid to the "Comisión de Fomento Minero" only when and if the profits are sufficient to cover such dividends.

Among the duties and responsibilities of the organization are the following: (1) The exploitation of the specified guano zones and the bat guano deposits existing in national territory in accordance with the terms of the contract with the "Comisión de Fomento Minero"; (2) increasing within the designated zones the development of guano from marine birds; (3) supervising the cleanliness of the guano zones; (4) destroying the natural enemies of the guano birds; (5) exercising vigilance to prevent disturbance of the guano birds and their destruction in any form, as well as the theft of living or dead birds and their eggs or their guano, and arresting guilty persons; and (6) expanding the areas susceptible of being inhabited by guano birds, as well as their reproduction.

The decree also authorizes the organization (1) to transport and sell directly to the farmers of the country the guano obtained and the fertilizer mixtures derived therefrom; (2) to acquire or construct all kinds of boats, barges, offices, warehouses, machinery, etc., indispensable to the adequate development of the guano industry; and (3) to establish selling agencies and guano warehouses, in those parts of the Republic deemed advisable, and to install laboratories and experimental stations to teach the proper use of the fertilizer.

(*Concluded from page 207*)

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ALONG THE *Agricultural Front*

▲ Western Hemisphere Developing Resources

Five new development agencies in the other American republics are playing roles of increasing importance in the development of hemisphere resources. They are Brazil's Rubber Credit Bank, the Bolivian Development Corporation, the Ecuadoran Development Corporation, the Peruvian-Amazon Corporation, and the Haitian-American Agricultural Development Corporation, better known in Haiti as SHADA. All except SHADA, which began 2 years ago, have been set up since Pearl Harbor.

Each agency assists the country to develop, both for immediate and long-range benefit, the potential resources of food and strategic war materials within its own borders.

Generally, these organizations function as agencies of their respective countries, with United States representation on the boards of directors and the support of United States management and technical experience.

In Honduras projects are under way in Comayagua, El Paraiso, Olancho, and Colón. In the Jamastran Valley alone more than 2,000,000 acres have been donated by the Government for the expansion of food production and 12,000 acres for grazing and lumbering. Near Tegucigalpa a 72-acre tract has been assigned for an experimental and demonstration project, involving the distribution of seed and tree stocks to local farmers and assistance in their problems of livestock feeding and of storage.

The main project in Nicaragua is in the Coco River region, where seed warehouses have been built to provide storage facilities for seed between seasons. The difficulty experienced in keeping seed from spoiling in that hot and humid climate has helped keep farming at a bare subsistence level.

In El Salvador, which is the most densely populated country on the continental mainland, the food men are tackling a problem of another kind. Here greater production depends on the reclamation of swamplands and on the combining of drainage with proper irrigation. This work is starting in the fertile region of Sonsonate near the Pacific coast.

Foodstuffs produced under the program are helping to nourish workers on strategic projects and relieve strains on supplies in key defense areas, according to reports received by the Institute of Inter-American Affairs in Washington, D. C. The Institute is the agency of the Office of the Coordinator of of Inter-American Affairs, through which the United States collaborates in the food program.

▲ Mexico Cultivates Drug Plants

In emergencies which cut off sources of vital drugs, prices of the supply on hand sail sky high. To meet present Allied needs and at the same time to aid agricultural diversification, a United States Government mission, headed by Dr. William H. Bonisteel, botanist and former professor at Fordham University, is collaborating with the Mexican Government in establishing in Mexico and Lower California agricultural stations, where the cultivation of various drug plants is under experiment. Already 10 stations have been established.

The United States has supplied the seed; the Mexican Department of Agriculture has taken an active interest; large and small landowners, including Gen. Abelardo L. Rodríguez, former President of Mexico, have donated land and labor.

One of the essential drugs is red squill. It is a powerful poison that does not harm human beings or domestic animals but is fatal to rats. Normally United States supplies come from the bulb of a plant that grows on the Mediterranean shores. The present supply is short, and yet rodent depredations of wartime food must be reduced.

Pyrethrum is needed by soldiers and others to kill insects. Japan was formerly an important source of supply. Derris, which used to come chiefly from the Malay Peninsula, furnishes rotenone, another now widely needed insecticide.

Belladonna, used in heart medicines and in corn plasters, came largely from India and Egypt. Prices for this drug jump during wartime from 15 cents to $1.50, or, as in the first World War, to $5.00 a pound. Two hundred thousand to 300,000 pounds a year are used in the United States.

Henbane and stramonium are also heart medicines; they are natives of Central Europe, although some henbane is produced in Egypt.

Peppermint leaves yield menthol to cure colds. That used for medical purposes has in the past come from Japan. Senna, a native of Anglo-Egyptian Sudan, Arabia, and India, provides an important cathartic.

Most of these have been planted at the new agricultural stations in Mexico to see how they will grow under soil and temperature conditions in that country. All will produce within a year of planting; some are even expected to yield their first harvests this fall.

▲ Baby Chicks by Airplane for El Oro

Airplanes are put to strange uses these days. One of the most novel is the transportation of baby chicks.

Recently the demonstration farm at Machala needed chicks for courses in poultry raising. From a large poultry farm near Santiago, Chile, came a first shipment of 1,000 young chicks, by airplane.

El Oro Province is in the process of rehabilitation, with the assistance of the Ecuadoran Development Corporation and the Institute of Inter-American Affairs. Chilean farmers are helping to restock the poultry areas, and airplanes are hastening the enterprise.

▲ United States Gets Mexican Binder Twine

Binder twine is a necessary item for farm machines that reap and bind grain. At harvesttime a lack of it causes great delay and loss. The recent agreement made by the United States Government with a group of factories in Yucatán, Mexico, to send into the United States increased supplies of binder twine is, therefore, an important one.

Binder twine is made of a single-ply "hard" fiber but contains certain percentages of oil and insect repellents. In order to be used with the machines it must be made to certain specifications. Normally it is a blend of henequen and sisal, both strong "hard" fibers, though in the United States, where sisal has been diverted from this use into cordage for the Navy and Merchant Marine, experiments have shown that 30 percent cotton may be used satisfactorily with henequen.

In addition to the henequen that, under the agreement, is to be manufactured in Yucatán factories, the United States is buying the exportable surpluses of the product from both Mexico and Cuba.

▲ Tea Grown in South America

Like silk, jute, and various other products of the Orient, tea is now being produced in South America. Tea plantations totaling 1,200 acres have been established in Peru, from which production is expected to total about 250,000 pounds of dry tea for the Peruvian market this year. Three of Peru's agricultural experiment stations have nurseries to propagate tea plants, and nearly a million young tea plants are to be distributed to farmers at cost. The Government has engaged an English tea expert from Ceylon to supervise the development of the industry.

▲ Wild Cinchona Found in Ecuador

A survey of wild quinine-bearing trees in Ecuador was conducted recently by the Ecuadoran Development Corporation, the governmental agency directing collection of quinine-bearing bark for the United Nations. The report of the survey placed the number of wild quinine-bearing trees in the country at 10 million and stated that this was a conservative estimate.

Fourteen of Ecuador's 17 provinces have climatic and geographical conditions highly favorable for growth of cinchona trees. Even in the other 3 provinces, the survey pointed out, there was a "variable" production of cinchona.

▲ Schools for Rubber Tappers

Schools for rubber tappers are being set up with United States aid in the other Americas to boost wartime production of rubber and to conserve the rubber-bearing trees for continued use after the war. Production from a trained tapper may reach 3 times that from traditional methods of hacking away haphazardly with machetes.

Already plans are under way for classes in Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Venezuela, and British Guiana and Trinidad. The Government of Panama has published an illustrated booklet in Spanish on the improved methods, which has been used for training in various countries.

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AGRICULTURE IN THE AMERICAS HALLY H. CONRAD, EDITOR

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Gifts of the Americas

TOBACCO

by LOUISE MOORE COLEMAN

Tobacco has been known to the civilized world for more than four and a half centuries. The white man's knowledge of its presence in the Americas dates from the first voyage of Columbus when two of his sailors observed natives of the West Indies smoking crude cigars. Within a half century, other explorers (principally Spanish) had found American Indians using tobacco in Florida and Louisiana, Mexico, Central America, Canada, Venezuela, Peru, Colombia, and Brazil. From these and other points in the New World, tobacco, its seeds, and the various practices of using it began to spread throughout the older countries.

When the demand for tobacco in Europe began to exceed the supply available from the American Indians, Spanish adventurers in the New World established tobacco-growing industries in many of their conquered territories and built up a colonial trade that flourished for nearly a century. They sold tobacco to Europe from their plantations in Santo Domingo, Peru, Bolivia, Florida, and Cuba. Seeds for many of the plantations were obtained in Mexico from the Aztec Indians, who had made considerable progress in the arts of civilization and had become the specialists of their time in the business of growing, curing, and manufacturing tobacco. Their use of tobacco even before the discoveries of Columbus compares favorably with modern practices. After meals, they served guests with tobacco in pipes or silver cigar holders. They were also acquainted with the art of making snuff.

In the botanical world tobacco comes from an interesting family. Linnaeus classified the plant as belonging to the genus *Nicotiana,* one of a large family of plants known as Solanaceae or nightshade. Among other members of this same family are the potato, egg plant, tomato, petunia, bittersweet, jimsonweed, henbane, and belladonna. The tobacco branch of the family is a large one, comprising numerous species, but the only ones to attain commercial importance are *Nicotiana tabacum* and *Nicotiana rustica.* Approximately 85 percent of the world production is of the species *Nicotiana tabacum.* This evidently was the species found by Columbus in the West Indies.

Consumption of tobacco has followed civilization for more than 450 years, increasing in direct proportion to upward trends in living standards. It has come to be an important article of world commerce, and few agricultural commodities are more universally used by man. Thus the Americas have contributed unto civilization a gift, the virtues of which may depend upon one's temperance or even upon a point of view. To the soldier, for instance, the gift of tobacco may be a soothing moment of uplift from scenes of which he is loath to speak; to the man on the street, it is one more contribution to pleasant living; to the weary, it is time out to rest; and to governments everywhere, it is a powerful source of revenue—a golden-feathered goose that seldom squawks.

PERU

Land

Peru is a land of great diversity. Within its half million square miles it has three distinctly different regions. Along the Pacific Ocean extends an almost rainless narrow coastal plain which, were it not for irrigation, would be virtually a desert. Running the entire length of the country is the 250-mile-wide stretch of high Cordillera of the Andes, varying in height from 5,000 to 20,000 feet. In this section is the beautiful Lake Titicaca, on the border between Peru and Bolivia, about 120 miles long and 40 miles wide, at an elevation of 12,644 feet. Finally, in the east and north is the vast Montaña or "Oriente," which is a part of the great Amazon jungle. Here the excessive rainfall, intense heat, dense undergrowth, and the inaccessibility of the lowlands cause them to be relatively undeveloped.

Climate

Although Peru lies entirely within the Tropics, it has all degrees of climate. The cold Humboldt current cools air masses and prevents rainfall from the west. On the snow-capped mountains of the Andes the temperature drops to Arctic levels. In the Oriente are the torrid heat and heavy rainfall of the Amazon Basin. And in between are all the varying ranges of temperature.

Population

The population of Peru, as given in the 1940 census, totals 7,023,111. Of this number 53 percent are white and mestizo, and 46 percent are Indians.

Agriculture

More than 85 percent of the population is dependent on agriculture. Although most of the production is for home consumption, large quantities of sugar and cotton are exported.

The coastal region, with its rich deposits of guano and its irrigation systems fed by the many small rivers flowing down from the Andes, contains the great cotton and sugar estates. Rice is produced chiefly in a narrow strip of coast in the extreme northwestern part.

Wheat is grown in the mountain valleys and the tillable highlands of the Cordillera. Corn is grown in the coastal valleys for livestock fodder and in the mountain districts, where it is an important article in the Indian diet. The white potato is indigenous to Peru, growing wild in mountain valleys and cultivated up to elevations of 14,000 feet.

While the coastal region is the principal commercial agricultural area, the Cordillera is the principal subsistence area. It is largely self-sufficient in the production of all basic foodstuffs, livestock, and dairy products.

On the eastern slopes of the Andes grows the coca shrub, from which is made the important drug cocaine.

The raising of cattle, sheep, llamas, alpacas, and vicuñas is an important industry of the Cordillera. The city of Arequipa, between Puno and the sea, is the great wool market.

Forests

The eastern slopes of the Cordillera are forested, and on the Amazon plain are large potential forest resources, which because of the remoteness of the area are as yet little developed. Rubber, cinchona and other medicinal plants, oil palms, and fibers await exploitation.

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IN THIS ISSUE

December 1943

NAMES & NEWS

Brazil Gives Coffee to United States Fighting Forces

In token of the good will existing between Brazil and the United States, President Vargas, late in October, officially delivered to the fighting forces of the United States 400,000 bags of coffee as a gift from the people of Brazil. The coffee is valued at more than $5,000,000. The gift was accepted in Rio de Janeiro by high-ranking officials of the United States Army and Navy and a civilian employee of the War Department in the presence of Ambassador Caffery, other officials, and United States newsmen. The colors of the two countries were stenciled in V-shape on a sample bag used in the presentation ceremony.

Chile Plans for Soil Analysis

The need has been recognized in the southern zone of Chile for a laboratory where soils, fertilizers, and seeds may be analyzed without being sent north to Santiago. The *Departamento de Divulgación y Propaganda Agrícola* (Agricultural Information) has started preparations for the establishment of such a laboratory at Temuco.

Peruvian Experts To Aid Panama

As an aid in the agricultural development program which the Republic of Panama is undertaking, Peru is sending 26 agricultural experts to work in the various Provinces and at the Divisa model farm. The experts include agricultural engineers, entomologists, horticulturists, agricultural instructors, rice experts, and field overseers. The men are to be selected by a mission sent to Peru by the *Ministerio de Agricultura y Comercio* of Panama and will be chosen on the basis of the locations where such specialized service is needed.

Agricultural Ministers Confer

On the occasion of the commemorative exercises for the centenary of the Brazilian town of Uruguayana, October 5, 1943, an unplanned but important meeting of the Ministers of Agriculture from Argentina, Brazil, Paraguay, and Uruguay took place. This provided an opportunity to work out a scheme for closer collaboration among the Agricultural Ministries of those countries, headed, respectively, by *General Diego Mason, Sr. Apolonio Salas, Dr. Juan Platto,* and *Ing. Arturo González Vidart.*

Among the matters discussed at the conference was a plan for the interchange of agronomists and other technicians by the River Plate countries for the purpose of mutual study and consultation. Scholarships were offered by the Ministers of both Argentina and Brazil for the study of agricultural subjects in their respective countries.

American Cultural Cooperation

Gifts of valuable books have been made at various times from Latin American republics to the United States, and vice versa. Such a gift has recently gone from Yonkers, New York, to the Inter-American Institute of Agricultural Sciences in Turrialba, Costa Rica. The collection, to be known as the Orton Memorial Library, was given by the Tropical Plant Research Foundation in Yonkers in memory of one of the great contributors to the agricultural and industrial progress of Latin America, Dr. William Allen Orton. The Orton library will be available to scientists, agriculturists, farmers, and others interested in agriculture.

Agriculture IN THE *Americas*

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Soil Study for Sound Agriculture

In order to achieve efficient agricultural production in the Americas, soil classification is needed. This entails extensive research, careful analysis, and accurate observations by soil scientists working in cooperation with all those concerned with agriculture and farm planning.

by CHARLES E. KELLOGG

The results of scientific research have never been more urgently needed, nor have the prospects for their application been brighter. Through scientific agriculture yields per man-day-acre in many parts of the world have been increased enormously, the area of adaptability of individual crops extended, and soil productivity increased. The present emergency requires rapid expansion in the production of certain crops, without waste of land, labor, or materials. Our scientific knowledge of the adaptation and care of crops and livestock and of the responses of soils to management needs to be put to work quickly. Unless such planning is based on a sound soil classification, great and perhaps fatal risks to both soil and people are involved.

Science is a great and powerful tool. It has been used on occasion for the benefit of a minority and for aiding the conquests of warlike states. It can, on the other hand, be used for the welfare of the common man throughout this Hemisphere and throughout the world. In fact, the common man's right to the fruits of scientific progress is a basic issue in the present war.

After the war, new crops and new farms can be developed. The opportunity exists for a balanced agriculture that can supply the needs of all people for nutritious food, a variety of fibers, and other necessities of a good life; and under scientific farm management agricultural people can have the labor income they need for health, education, and good living.

Science is the tool that *can* make these things realities in the American republics as well as in all democratic societies. An expanded research program in agriculture, directed toward the welfare of all the people, will be needed after the war. In order to apply results accurately and effectively—to develop patterns of land use that take advantage of scientific knowledge and fit the landscape—the soils must be known.

In the past people have often failed to accommodate their plans to the soil. In the United States of America, for example, the methods of farming that originated in Western Europe or in the eastern part of the country were carried onto other soils—soils to which they were not adapted—with bad results to the land and even more serious effects on the people. The same mistakes have been made elsewhere. These may be excused, perhaps, because an adequate scientific basis of agriculture was lacking, but there is no excuse now. A workable system of soil classification has been developed, and these misfits of land and people can be prevented. Part of the work undertaken at the cooperative agricultural stations in Ecuador, Peru, El Salvador, Nicaragua, and Bolivia is directed toward this end, as well as at other field stations of the Americas.

The Purpose of Soil Research

Soil classification is an integral part of fundamental and applied soil research. It is based upon the morphology (form and structure), genesis (origin and development), and geography of soils as disclosed through scientific research and surveys. At the same time, soil classification is a practical tool. The work is done with regard to the significance of soil characteristics and soil types to growing plants, management practices, and land use. These two aspects of the work—the scientific and the practical—depend upon each other. Without a firm basis in science, soil classification and mapping become superficial and transitory: they have no general or permanent value. Without regard to the use of soil types in agricultural production they become academic and limited in application: farmers cannot use the results.

The main purpose of soil research is to determine the kind, yield, and quality of plants that can be produced under different, physically defined systems of management on various types of soil, and the reciprocal influence of these systems on the long-time productivity of the soil types. Not all soil researches are, or should be, directed

The soil type is defined in terms of the profile, its external characteristics, and the vegetation.

toward this immediate end. Many are directed toward the discovery and clarification of fundamental principles of the science, which, in turn, are used in seeking solutions of practical problems of production and the maintenance of productivity.

Yet it is always helpful, even to those engaged in fundamental research, to recall that soil knowledge, or other scientific principles concerning the relationship between soils and plants, find application in some *definite* place—on a *particular* soil type—and with a definite type of soil and crop management, whether a simple or a very complex one. In other words, although soils and plants are often spoken of in general terms, in practice specific plants are grown on specific soils under some type of management. On most successful farms there are several crops, and many practices are fitted to a pattern of different soils.

Need for Classification

The principles of all sciences are developed through the careful classification of facts and their interpretation. These facts, which are the raw materials of science, come from observations of nature and from the experiences of people, as well as from scientific surveys and experiments. Through the classification of these facts relationships are discovered, principles developed, and the characteristics of things remembered.

In soil science the problem of classification has, perhaps, a special significance, because the need is so obvious and so critical to the use of the principles in practical agriculture, as well as to their formulation. Soils are not only physical, chemical, and biological things; they are geographical; they do not occur promiscuously over the earth but in specific geographical associations. Natural soils are made up of layers or horizons which may vary a great deal from one another. The surface soil may be sandy and the subsoil clay; or the surface soil may have a mellow, granular structure, while the subsoil is a massive hardpan or claypan. Even though the surface is acid, the subsoil may be alkaline. Plant roots grow in all these layers, not just in the surface. The penetration of water depends upon the whole soil, not simply upon the upper part moved in cultivation. Thus the definition of a true soil in nature, or in the field or garden, must take account of the depth, thickness, arrangement, and characteristics of all the layers that influence the functioning of the soil and its ability to support and nourish plants.

Besides these internal soil characteristics are external features that are an essential part of the soil and vital to its use. Climate is one of these. First of all, climate has a great deal to do with determining the kind of soil that exists in any place, especially as it controls vegetation and other organisms living in the soil. The amount of leaching and the kind and intensity of chemical reactions are conditioned by climate.

Relief is also an important characteristic of the soil type. The shape, length, and degree of slopes, and their pattern, not only influence the formation of soil types, but also are important to their functioning when cultivated. The problem of water control, the hazard of erosion, and the use of farm machinery are all partly dependent upon relief.

Each soil type is a kind of landscape as well as a section of the life-giving surface layer of the earth. Soil types occupy areas, not simply points. They have three dimensions in space. When soils are classified, similar landscapes are placed together, as well as soils with similar physical and chemical properties.

Since soil types occur intermingled with one another, the observer must be able to recognize the soil type upon which he is recording his observations and making his experiments. Having made the observations accurately, classified the results according to properly defined soil types, and developed principles for application in practical agriculture, specific recommendations regarding crops or management practices for an area of land can be made if the type of soil be recognized.

Several soil types are usually found in one farm. To study systems of farm management and broader community problems of soil use, a pattern of soil types must be dealt with as a whole. For such purposes, soil types are grouped into soil associations, each of which is defined in terms of the relative proportions of individual soil types and their pattern. A soil association bears a relationship to individual soil types analogous to that between a plant association and individual species of plants. Individual members of a soil association may be very unlike one another, but similar systems of management are adapted to the soil pattern throughout the area of an association.

The most generally satisfactory and economical method of ensuring accurate recognition of soil types is through the use of soil maps, upon which the boundaries of carefully defined soil types and associations have been drawn accurately from field observations. For these maps to have their maximum usefulness the work must be done according to standard procedures and nomenclature consistent with international usage as developed over many years of research. Otherwise the results of research in one region or country cannot be applied accurately to similar soils in other countries. For this reason soil scientists play a significant part in those countries where food-production programs are now under way to increase supplies of foodstuffs for home use and for shipment to the Allies.

Given a uniform system of soil classification and nomenclature that can be understood throughout the Western Hemisphere, the results of experience and research in each of the Americas may be used in all on the same soils. Through cooperation in this way unnecessary duplication of work can be avoided. Where elaborate researches have been carried out on a soil type, or even a group of closely related soil types, in one country, that work need not be repeated on the same soils in other countries, provided the soils have been properly classified and named.

There are thousands of soil types in the Western Hemisphere. Their examination, definition, and mapping will require great skill and a knowledge of the results of soil research in both field and laboratory. But nothing less can ensure the full use of modern agricultural science in all the Americas.

The Soil

Fundamental ideas of the nature of soil have changed greatly in the past 45 years since the Soil Survey first began in the United States. Once soil was thought to be a more or less simple "storage bin" of plant nutrients, resulting from rock decay. By analyzing the soil and finding the amounts of the various plant nutrients in it, and by knowing the chemical composition of the specific crops to be grown, one thought that the fertilizer required to maintain fertility could be calculated, or that one might calculate the number of crops that could be produced before the soil became "exhausted."

This idea is now known to be not even approximately true for several reasons. Minerals within the soil become available to plants at different rates. Plants vary in the depth and feeding power of their roots. Microorganisms have profound influences on the nitrogen and the other available nutrients. The physical condition of the soil—structure and water-holding capacity—are as important to plant growth as are the nutrients. The soil is in continual change. In some, new supplies of nutrients are being added to the surface through deposition; whereas others are gradually losing leached surface soil through normal erosion, and fresh minerals are being incorporated from beneath.

Attempts to classify experience with soils and agricultural data on a geological basis failed, because two entirely different soils might be developed from identical rocks if there were differences in relief, climate, age, or vegetation, or in some combination of them. Geology is very important, especially in the definition of local soil types, but climate and vegetation are more important generally.

The classification must be based upon observable characteristics of the soils themselves and not upon the genetic factors producing them. The characteristics of any soil are due to the combined influence of all the genetic factors, and the effect of any one by itself cannot be determined.

Another common error in early soil classification arose from the observation of single soil characteristics without regard to the others with which they were associated. For example, maps have been attempted showing certain selected soil characteristics, rather than completely defined soil types, in some sort of complex of symbols where one symbol might stand, let us say, for texture, another for slope, one for reaction, another for depth, and so on. This analytical approach is based upon the unconscious (and untenable) assumption that a characteristic has the same influence under all conditions. In one combination of characteristics, a sandy texture makes for better water relations in a soil than a heavy texture, whereas in other combinations the reverse is true. Some sloping soils erode easily, others do not.

Rubber trees in Brazil growing on two soil types. The soil on which the more vigorous trees in the background are growing has sufficient normal erosion to maintain productivity through incorporation of fresh minerals from the rocks beneath.

That is, there is no direct relationship between degree of slope and erosion hazard, considering all soils. Black color usually means that a soil is high in organic matter and fertile, but some black soils are infertile.

The analysis of a landscape or soil into single components has use, and the results should be recorded in the notebook. Such analyses are, however, only a preliminary to classification. Classification is a synthetic process. Soil types are distinguished from one another by a group of characteristics and sometimes no one of these may have value by itself, but the whole group, taken together, is significant.

The danger of associating certain crop adaptations and management responses with a single soil characteristic is perhaps the greatest hazard in applied soil science today. There is no direct relation between any single characteristic of soils and their productivity, adaptability for a specific crop, or response to a management practice. It is the *combination* of all its characteristics that gives a soil type its distinctive character and distinguishes one landscape from another.

Accurate Observations Are Essential

The facts revealed by accurate observations are the essential building stones in classification. The scientist must not only observe and measure the significant characteristics but also study their relationship to one another and to the whole environmental range of living plants and animals. Around soil types defined in these terms the results of research and experience can be combined and extended to other areas. Competent observers can recognize these types where they occur, or soil maps showing their boundaries may be constructed in the field.

Agricultural research of the future must concern itself more than in the past with the problems of the small farmer growing many crops for subsistence.

Field experiments dealing with plant production and agricultural practices need to be located on the most significant soil types. Those located on unidentified soils may yield data, but these data have limited significance or value until it is known where they may be applied. Thus, in the organization of research, the first step is a careful examination of the soil to determine its place in a system of classification, its relationship to other units in the system, and its extent and importance.

Much of our knowledge about soils has been gained through careful analyses of experience. This method is especially important to us now when under war conditions there is too little time to organize long-time researches. By the orderly observation of practices on farms and plantations, and of the soils used and to be used, sound recommendations can be developed for other farms and plantations, and for new land.

Soil Productivity

The productivity of a soil is the result of management practices applied to the soil—to the entire combination of characteristics that determine its nature and set it off from other soils. This productivity is expressed in terms of yield and quality of crops that can be produced under different, physically defined systems of management. No soil is productive of crops without some kind of management. Some soils need only to be plowed and cultivated to produce good yields; others may respond little to such simple practices, yet with more intensive practices like fertilization, liming, terracing, drainage, or irrigation, or some combination of these, high yields of good-quality products may be obtained. A soil naturally low in fertility may respond to fertilization and become productive. A soil may be unproductive with one rotation of crops and productive with a different group of crops.

Thus productivity of soil is really response to management. It is measured in yields only under specified management practices. Changes in yields up or down may be the result of changes in soil, in husbandry, or in both. Even the particular point at which it is most economical to maintain soil productivity depends upon management and upon costs and prices as well as upon soil conditions. When one thinks about the maintenance of soil productivity or soil conservation, one should think of it in terms of the optimum level of productivity and not simply in terms of the productivity that the soil might have when first cultivated. There are conditions under which it is wholly uneconomic and impracticable to attempt to maintain the productivity at the level which the soil had when first cultivated. An example would be some of the deep dark-colored soils developed under tall grasses in the subhumid temperate region. On the other hand, on many soils in the warm, humid, forested regions, having

very low productivity when first plowed, a satisfactory system of management is one that can maintain the soil at a great deal higher level of productivity.

Usually, but not always, soil types occur in small areas. Many landscapes or soil associations have a complicated pattern of different soil types intermingled with one another. A crop or practice good for one field may not be at all adapted to another one beside it. The utilization of land for various crops, grasses, and trees may finally become more or less adjusted to these differences of soil through the old trial-and-error method by which many people fail and lose their labor and capital, or simply exist on the edge of starvation. Under such conditions the soil itself becomes poorer through declining fertility, loss of structure, an accelerated erosion, or more commonly, a combination of these.

A knowledge of the productivity of soils and the management practices required to maintain them, together with suitable maps showing their location, permits farmers to adjust their utilization of the land to the pattern of soil types in the beginning and thus avoid waste of time and effort in improving land not suited for farming.

Cooperation Essential for Recommendations

The function of soil scientists is to determine the yield and quality of crops that can be obtained under several systems of management on various soils and the effect of these systems upon the long-time productivity of the soils. Although this seems like a great task—and it is a great task—still more is needed for making definite recommendations to agricultural producers. Even to go this far, soil scientists, including those engaged in soil classification, must cooperate closely with agronomists, horticulturists, pathologists, and others dealing with management practices, plant growth, and plant production. But when the anticipated yields and effects upon productivity, under a series of alternative management practices, have been reasonably well established for a soil type, there still remains the question of which of these practices should be recommended for a particular field of this soil type in some farm or plantation. The answer to this question cannot be obtained entirely through soil and agronomic research. It depends in part upon the cost of management practices, the skill of managers, the availability of labor, probable prices, and the general long-time economic outlook. Thus, having combined their data and made possible the recognition of the units of soil classification through the construction of soil maps, soil scientists must cooperate with economists or management experts in selecting from one or another the recommended management practices for a particular agricultural enterprise.

There are many kinds of soil in the Western Hemisphere, each with its own characteristics and environmental relationships. A study of these, in light of existing knowledge, and soil maps, showing their location, can go a long way toward establishing a sound basis for agricultural planning now and in the post-war period. Scientific research should be put to work in the field, for the benefit of both soil and people, not left in the laboratories and libraries. Agricultural adjustments should not be made on the costly trial-and-error basis, with all its heartbreaking consequences, particularly in view of the need throughout the world for foodstuffs.

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SOIL CLASSIFICATION

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America—Home of the Bean

Not all varieties of beans are indigenous to the Americas, but many are, and others have been adopted. Under wartime conditions they are becoming increasingly important throughout the Western Hemisphere.

by WILBUR H. YOUNGMAN

Beans are so generally grown in the Americas that they are accepted as commonplace blessings. Yet they are occupying a prominent place in the many programs for increased food production. Seeds are being distributed to farmers, and acreages are being allotted for their production in practically all undertakings directed toward growing larger supplies of foods for home consumption, whether in the Victory Gardens of the largest American Republic, Brazil, or in our tiny Central American neighbor, El Salvador.

The current demand for beans as a wartime food is easily explained. Beans have for ages been the staple food—together with corn in some countries and rice in others—among the peoples of many countries. They are high in protein, contain substantial quantities of essential dietary minerals, and are a rich source of vitamin B_1. They are easily stored, are not too bulky for shipment, and are relatively high in energy value.

The present demand naturally focuses attention upon America, the home of the bean. Actually the discovery of the New World very nearly marks the beginning of recorded history of the common, lima, and runner beans. Beans were cultivated in America long before the time of Columbus, for they were found in many of the pre-Columbian Andean tombs. Earliest American history records that many types were found, indicating that cultivation of the crop was not then new.

Beans Many and Varied

The bean family is large and varied, comprising some 60 genera and over 1,000 species of plants. The most important genus, *Phaseolus*, contains what to Americans, at least, are the more useful kinds. The common dry bean and the garden or green bean (sometimes referred to as the kidney bean) are horticultural varieties of *Phaseolus vulgaris*. The lima bean, botanically speaking, is *P. lunatus*, whereas the runner bean, commonly used as an ornamental in this country and as an important food crop elsewhere, bears the colorful designation of *P. coccineus*. There are some 100 species of *Phaseolus* native to the warmer parts of America. Less than a third of this number are native to similar areas in the Old World. Most of this large number of species are of little economic value. In addition to the three species mentioned above and the Tepary bean, which is of considerable importance in hot semiarid regions, there are five oriental species of *Phaseolus* of secondary importance.

A second genus, the *Canavalia*, includes about 40 species, of which some 25 are native to the Americas. Only two are important economically, and the better known is the Jack bean, or Chickasaw lima as it is sometimes called, *C. ensiformis*. Occasionally the Sword bean (*C. gladiata*), whose seeds are said to be quite palatable, is grown in the southeastern part of the United States.

The Pigeonpea, a species of the *Cajanus* genus, has not been definitely traced back to an origin in the Americas, but it has been grown so long and is so widely distributed throughout the Tropics and Subtropics that it is considered by some to be a native. The *Cajanus* is a small genus of which the Pigeonpea (*C. cajan*) is the only member that is well known.

The Cowpea, a species belonging to the *Vigna* group, is widely grown in the Western Hemisphere but is native to Central Africa. The *Vigna* group is quite extensive, containing some 60 species. With the exception of the Cowpea, however, they are relatively unimportant.

In the Tropics the Lablab or Hyacinth bean is widely grown and used but is seldom heard of in the more temperate regions. This member of the *Dolichos* genus, sometimes referred to as the Bonavist bean, is used both as a "snap" bean and a dry bean. Its native home is seemingly lost in antiquity.

Less closely related to the above-mentioned genera is the Broad bean, variously known as Horse, Windsor, English Dwarf, and Field Tick bean. It is a member of the *Vicia* genus (*V. faba*) and is native to the Old World. It has spread into the Western Hemisphere, where it grows better in cooler climates than any other member of the family. The vetches, members of the same genus, are widely grown for food and for forage.

Thus the Western Hemisphere is the home of a substantial portion of the more important members of the bean family. In addition, Americans have adopted and

grown extensively most of those that are not native if they were economically valuable. This accounts, in part, for the large number of kinds to be found in the Americas. Through centuries of cultivation types or varieties have been developed to meet the needs of the cultivators. Some are commercially important; many are grown for domestic consumption only.

Most of the Latin Americas grow two general classes of beans: (1) The thick-skinned, usually rather large-sized kinds for domestic consumption, and (2) the standard export varieties that are relatively thin-skinned.

Chile's Beans

In Chile, for example, there is a long list of kinds grown but less than 10 are produced in sizable quantities. The others are produced for home use only and may not even enter internal trade. The following, arranged according to acreage, are reported to be the most important: *Bayos*, *Frutillas* (cranberry), *Burritos*, *Araucanos* (cranberry), *Arroz* (pea), Red Kidney, *Milagros* (marrow), *Caballeros* (navy), *Cristales* (marrow), *Pallares* (Madagascar or butter), and Red Mexican. The *Arroz* and Red Kidney are the most important export types, but *Caballeros*, *Cristales*, *Pallares*, and Red Mexican are also exported.

Chile has long been a bean-exporting nation, having shipped substantial quantities to the United States for many years. The quality of the beans obtained from Chile is very high.

Although Brazilian beans are numerous as to kinds and sizes, they lack the uniformity and high quality usually associated with an exporting country. Prior to World War I Brazil was an importer of beans, even though they were commonly grown in most parts of the country. With imports reduced by the war, domestic production was rapidly expanded, and considerable export shipments were made. After the war lack of export quality soon lost the foreign market for Brazil, but production remained high enough to supply domestic needs. Today Brazil is still a major producer of dry beans, probably ranking third among the nations of the world.

The black beans, *Feijoa Preto* and *Preto Porto Alegre*, occupy by far the largest acreage in Brazil, approximately 65 percent of the total area devoted to beans. Most of the production is used within the country, but small quantities are exported to Cuba and other countries. These beans correspond to the variety known in the United States as Turtle Soup, also as Black Spanish and Black Turtle.

The *Mulatinho*, a brown bean, is second in importance (25 percent of the acreage) and is also used largely for home consumption. White beans and the various colored beans, such as *Manteiga*, *Enxofre*, *Praia*, and

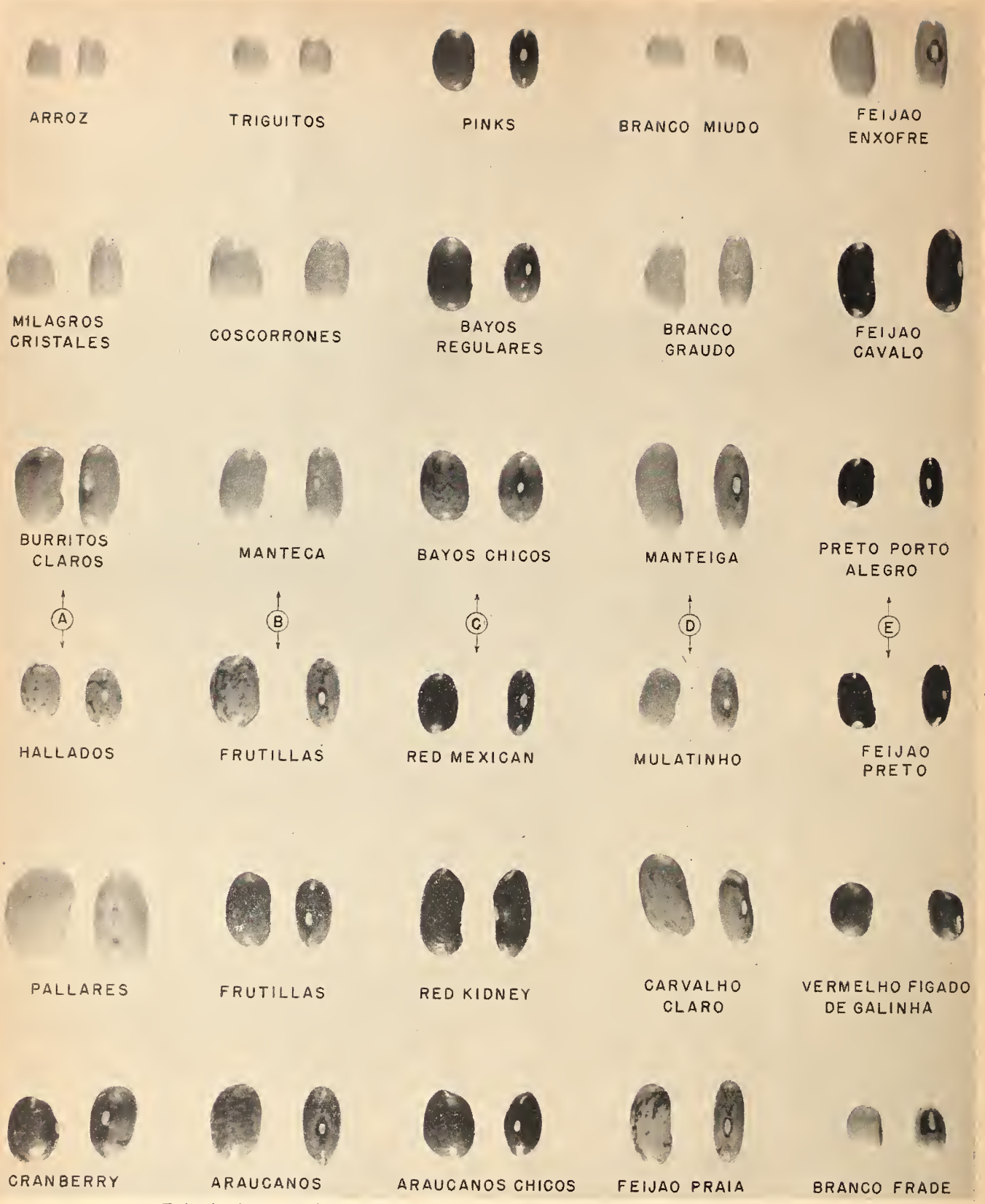
Beans and corn planted together, with the cornstalks supporting the beans—a common practice in the region around Cintalapa, Mexico.

Cavalo, make up the remaining 10 percent of the annual acreage. Except for the white beans, of which there are large and small sizes (*Branco Graudo* and *Branco Miudo*), and perhaps butter beans (*Manteiga*), these beans do not generally enter retail or wholesale trade.

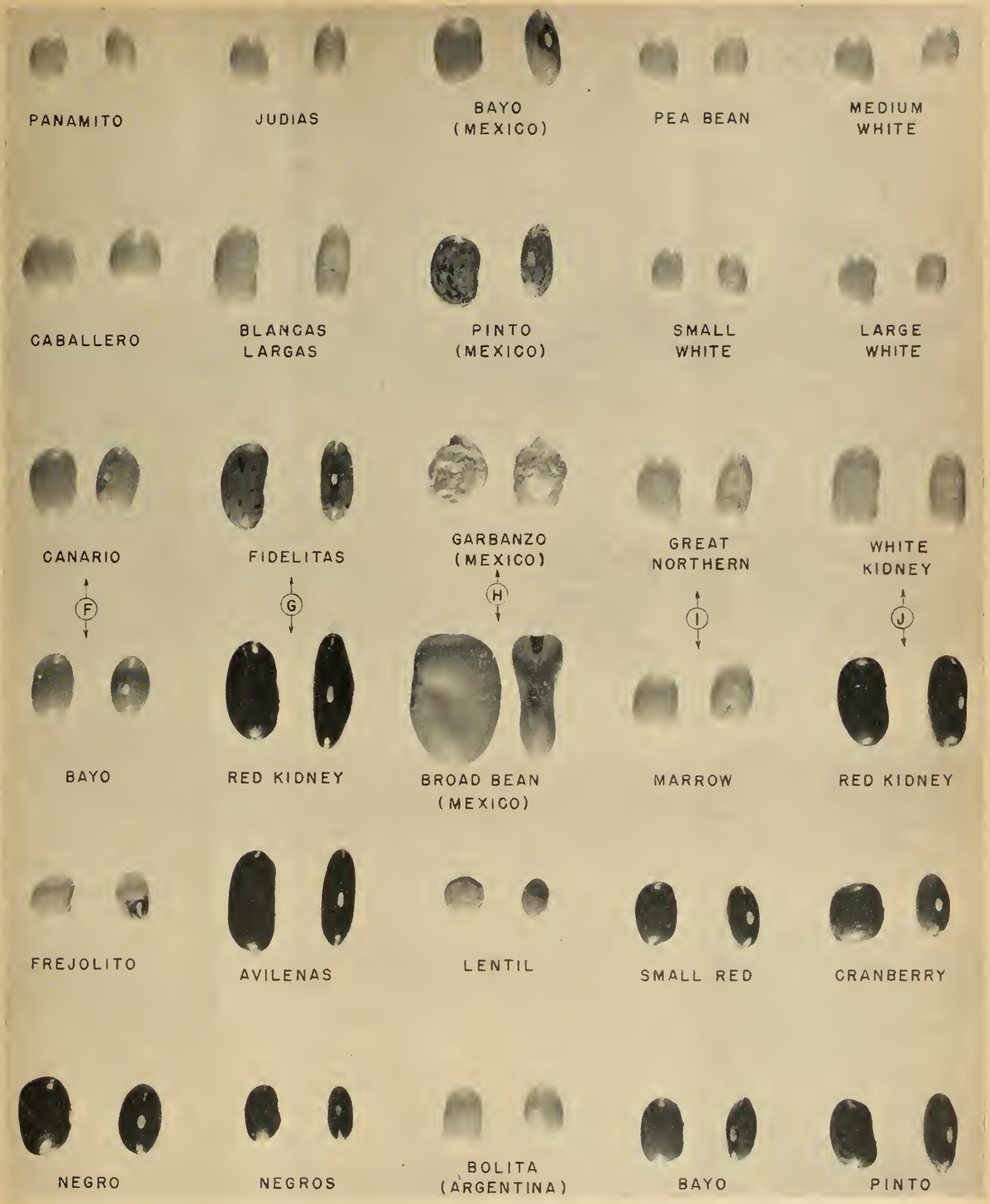
Mexico Large Producer

Mexico normally produces well over 110,000 (average 138,000) short tons of beans annually. The black bean, *Frijol Negro*, is widely grown and used principally for domestic consumption. Some are exported to Cuba and other Caribbean points. The *Bayo* bean is the important commercial variety and to a limited extent is an export variety. In addition to the black and *Bayo*, a number of other colored varieties are grown, although they do not constitute an important part of the total bean acreage.

Chile, Mexico, and Brazil export most of the beans entering world trade channels from the Latin Americas, but other republics are important producers. Peru, for a long time, has produced substantial quantities to meet internal needs. The most important Peruvian beans are: *Bayo*, *Canario* (yellowish-colored marrow type),



Principal types of beans grown in Chile (columns A B C), Brazil (D E)



Peru (F), Dominican Republic (G), other Latin American countries (H), and the United States (I J)

Caballero (large marrow), *Castilla* (black-eye), *Negro* (black), *Panamito* (pea), and *Pallares* (lima).

Beans produced in the northern provinces of Peru are shipped to the deficit producing sections in the southern part of the country. Few, if any, are exported to other countries, and normally Peru does not import beans to supplement the domestic production.

Argentina produces several varieties. The Bolita, similar to the Great Northern, is probably the most important commercially. Argentina, however, imports beans to supplement domestic production as do some of the smaller republics. This seemingly is a paradoxical condition, for in many areas throughout the Latin Americas beans grow wild, needing only to be picked as they mature, but these wild beans are of inferior quality and do not enter the domestic trade. When the commercial crop is short, importations are necessary.

Larger Exports Possible

The climate and the long growing season of some of the Central and South American countries favor the production of beans, and, with suitable grading and warehousing facilities, the crop could be greatly expanded to take care of any export trade that might be developed. With the exception of Chile and, possibly, Brazil and Mexico, the grading of beans is very poorly done and consequently not generally acceptable in the world markets. With the adoption of suitable classes and grades, beans from the producing countries could compete in most of the world markets, although the trade would have to be educated to some of the types grown in those countries as well as to the new standards.

The Latin Americans grow mainly the colored types of beans, which are preferred in their markets. This is especially true of the *Bayos*, brown, pink, black, and red beans. The northern markets, on the other hand, prefer white beans. Therefore if the Latin Americas are to enter the larger world markets, they would probably find it advantageous to expand their production of the various white beans.

Photo by Dr. Pendleton

Planting of beans on a bank along the Escondido River, Nicaragua.

Our southern neighbors are also handicapped in entering world bean markets by a shortage of suitable storage and fumigating facilities. Warehouses are not such a limiting factor as is the fumigating equipment. The bean weevil is widespread throughout the bean-producing areas and, unless it is controlled, causes serious damage to dry beans while in storage. Neither the storage nor the fumigating facilities, however, need be serious obstacles, since they can be constructed in a comparatively short time.

Some of the countries have the advantage of being able to harvest two crops of beans a year, although in most instances the two crops are harvested at different seasons and result from variations in climate and topography. They should be considered as parts of the same crop for the country as a whole.

War Stimulates Production

The present wartime demand has done much to stimulate bean production among the Americas. The United States has already purchased larger than normal quantities of beans from Chile and Mexico. Other countries are contemplating expanding production during the coming year. Beans are a comparatively easy crop to grow, and the short time required for growing and harvesting permits increased production within a relatively short period.

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In the temperate zone of South America, weather travels from east to west with heavy rainfall all the way across the continent to the Andes; in the United States and Canada, it travels from west to east with heavy rainfall on the Pacific slope and desert areas lying east of the Rocky Mountains.

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South of the Equator, in the middle latitudes, the seasons are the reverse of those in North America, winter beginning on June 21, and summer on December 21. For this reason, the well-to-do women in the fashionable centers of South America often wear the latest fashions in advance of those in New York.

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The Atacama Desert, extending more than a thousand miles along the northern coast of Chile and northward through Peru, is one of the driest spots on earth, for rain seldom falls there more than one day annually.

Wheat in Peru

Peruvians have grown wheat for several centuries but not on a scale to meet domestic requirements. Rugged terrain and traditional methods of cultivation are obstructing the Government's efforts to increase production.

by HUGO W. ALBERTS

Some historians state that wheat was introduced by accident into Peru in 1538, when a few grains found in a cask of rice imported from Spain were planted in a garden. At first it was grown in the river valleys along the coast. Since 1786 its cultivation has been relegated to the *sierra* region. There are a number of reasons for this. Some claim that an earthquake in 1786 caused a slight deflection of the Humboldt Current in the Pacific Ocean, which effected a change in the climate of Peru that was detrimental to wheat culture. Then the crop was attacked by wheat rust, which had previously caused little damage. Later industrial crops developed in the coastal valleys, which displaced wheat, because the former were more profitable. Finally, the development of industrial crops made it possible to purchase better qualities of bread wheats from Argentina, Chile, Canada, the United States, and recently from Australia to meet the demand in the coastal regions.

The areas of wheat cultivation are distributed throughout the *sierra* region of Peru and in isolated areas in the coastal valleys. Most of it is grown at altitudes of from 3,000 to 10,000 feet. Practically all the wheat in the *quebradas*, or canyons, and in the coastal valleys is grown under irrigation. In the *sierra* most of it is produced under natural conditions of rainfall. The acreage seeded in 1940 totaled about 334,000 acres and was distributed as follows: In the Department of Junín, 35 percent; Cuzco, 21 percent; Huancavelica, 17 percent; Arequipa, 9 percent; and the remainder scattered in other parts of the country.

The crop of 1940, which may be considered a fairly normal year, amounted to about 3,700,000 bushels, or an average of approximately 11 bushels per acre. The highest yields—about 51 bushels per acre—were obtained under irrigation in the vicinity of Arequipa, where the Mentana variety, which came originally from Italy, is grown almost exclusively.

Near the coast and in the Department of Arequipa wheat is seeded in May and June so that its principal growing period is during the winter months. In the *sierra* most of it is grown on unirrigated lands in patches on mountainsides, with slopes of from 20 to 35 percent and sometimes 50 percent. On these it is cultivated in the same primitive fashion followed several centuries ago. Labor-saving machinery on the small patches of land, so far, has not been found economical. Primitive wooden plows, flails, sickles, and oxen comprise the working equipment of the *sierra* Indians. A harvesting scene recalls Biblical times. Each native calls upon his neighbors for assistance, and the harvest takes on the character of a community fete. The grain is threshed by treading oxen and winnowed by the breeze. The plaintive notes of the native flute (*quena*) add the final touch to the picturesque scene.

Numerous varieties of wheat have been tested at the agricultural experiment stations in various parts of Peru and distributed among growers. Other than the Mentana mentioned above, the most important varieties are Marquis, Spring Progress, Red Manitoba, Hungarian, and several soft wheats. The semihard wheats have a tendency to produce "candeal" or kernels of a soft type after having been grown in the country for several years. A small quantity of Khaply, a durum variety, is also produced.

Difficulty has been experienced in obtaining domestic wheat that will retain good quality. The domestic lots that have been analyzed were found to contain foreign bodies, such as straw, earth, pebbles, and seeds of trebol (*Melilotus indicus*). The seeds of the trebol gave the wheat a characteristic odor. The earth and pebbles in the grain resulted from the primitive methods used in threshing. Barley and oats were mixed with the wheat. In weight and baking value the Peruvian wheats were considerably below Argentine, Australian, and Canadian wheats.

All the wheat grown in Peru is consumed within the country. In the *sierra* it is transported to local mills principally by means of llamas as pack animals. A pack train of 30 llamas can, however, carry little more than a metric ton of wheat (about 37 bushels). At lower elevations burros are used, and, if the wheat is grown near highways, trucks are employed, particularly along the coast.

In 1940 the total apparent domestic consumption of wheat in Peru amounted to only about 8,800,000 bushels, since rice is the staple cereal of the country.

Although there are several roller mills in Lima and Arequipa, most of the flour made in other towns is the product of stone mills. Approximately 90 percent of the wheat milled in the Lima area and 80 percent of that milled at Arequipa is imported. Comparatively little flour is imported through ports on the west coast; most of it is sent up the Amazon River through the port of Iquitos. The United States supplied most of the wheat imported into Peru during 1942, but small amounts came from Canada, Argentina, Brazil, and Chile.

The most serious disease of wheat in Peru is black stem rust, *Puccinia graminis*, which is very destructive in some years. Its alternate host is the barberry, *Berberis divaricata*, and probably also *B. carinata;* both grow wild and are abundant in the wheat-growing areas of the *sierra.* Yellow rust, *Puccinia glumarum*, causes considerable damage in the *sierra* also, and brown rust, *Puccinia triticina*, is troublesome in some places. In certain seasons, wheat blight injures the grain. The most troublesome insects that attack wheat are the tip fly, *Oscinis frit*, and the aphid, *Aphis maidis.*

Since 1929 the Government of Peru has been trying to expand the production of wheat in the country. For this purpose various measures have been undertaken. Premiums have been offered for good quality and for extending the wheat areas. Loans have been made to aid the farmers in growing wheat. Minimum prices have been established. Seeds of improved varieties have been exchanged with the farmers for the poorer seeds they had used previously. New strains have been tested at agricultural experimental stations. Discounts have been allowed on fertilizers, and freight rates have been lowered on wheat moving from the interior to the coast. There has been free distribution of seed, loans have been granted at low interest, and government-owned threshers have been allotted to the wheat regions for community use at a nominal fee.

Wheat Expansion Slow

So far the response to the stimuli given by the Government has been limited. Prospects indicate that the production of wheat may not increase far beyond its present output for quite some time to come. In the first place, the area of land adapted to wheat production is restricted. Most of the wheat is grown in small patches insufficient in size or in areas where the topography is too rough to permit the use of modern agricultural implements. In many of the present wheat regions, where no irrigation facilities are available, production is a gamble with weather and disease. Rains are not dependable.

Courtesy Peruvian Ministry of Foreign Relations

Wheat growing at La Molina Experiment Station, Peru.

Sometimes they come too soon and at other times too late to be of much value to the growing crop. When they come just before the grain is headed, the plants are subjected to severe attacks of rust that sometimes destroy almost the entire crop.

Some of the land has been cropped continuously, and the productivity of the soil is reduced to a point where it will not bear a crop. Since fertilizer is not abundant, this cannot be offset in all cases. Then, too, climatic conditions are favorable for the development of soft-grained wheats that are not desirable bread types.

The distribution of the wheat within the country is limited; the demand in the producing regions exceeds the outturn, and the wheat does not move to other areas. Each locality grows its own strains, and they vary in baking qualities from one region to another.

The population in the industrial region along the coast has purchasing power and demands the best quality of wheat that can be obtained from the world markets. Therefore its requirements are met by imports rather than by domestic production.

Considerable improvement in quality may be attained by Peruvian wheat farmers, and better transportation may be provided for moving the wheat from surplus into deficit regions. The wheat lands, to a limited degree, may be expanded. Yet the Peruvian farmers probably will continue to grow their grain for home needs only, and largely in the old traditional manner, for some time to come, despite the efforts of the Government to encourage increased production.

Reading ABOUT THE AMERICAS

The World Coffee Economy with special reference to Control Schemes, by V. D. Wickizer, 258 pp., illus.; Food Research Institute, Stanford University, California, 1943. This book surveys the coffee industry and the problems that confront it in a world beset by war. The basic factors of the coffee situation are discussed, and an appraisal of this commodity's place in world production, trade, and consumption is made. Following a description of the various types, brands, and blends entering world markets, the methods employed in the cultivation and preparation of coffee for marketing are set forth. Brazilian stabilizing schemes receive particular attention, the significance of coffee in Western Hemisphere economics is pointed out, and the Inter-American Coffee Agreement is evaluated. The text of the book is generously supported by statistical material, and a documentary appendix includes the Coffee Agreement and many statistical tables covering production, trade, consumption, etc. Mr. Wickizer's study, the second of a new series of commodity policy studies will be of value to the coffee trade, government officials, economists, research workers, and students of the various phases of commodity work.

The Caribbean: Laboratory of World Cooperation, by Devere Allen. 40 pp. League for Industrial Democracy, New York City. 1943. A presentation of the problems facing the Anglo-American Caribbean Commission, which was set up by the Governments of the United States and the United Kingdom in March 1942 largely for the purpose of raising standards of living and improving social conditions on the various islands of the Caribbean area. Although consideration of these problems has had to give way to present wartime demands, many complex questions await solution at the close of the war.

Letters from the Argentine, by Francis Herron; 307 pp.; with map; G. P. Putnam's Sons, New York. 1943. Letters and memoranda written by the editor of a weekly newspaper in a small town in Iowa about people, places, and customs found in Argentina. Although a reader soon realizes that the writer is an unusually likable and sympathetic person and therefore likely to be well received in any country, he is struck by the friendliness displayed toward a visitor from the United States by the so-called proud Argentineans. Mr. Herron made a conscientious effort to understand and interpret the characteristics that made his southern friends similar to or different from their counterparts in the United States. Although his letters are charming and full of local color, he never sacrifices sincerity for effect. The good-fellowship he enjoyed should inspire others, both north and south, to go and do likewise and thus draw two great American countries together in bonds of friendship and understanding forged by the interchange of visits and ideas.

Refugee Settlement in the Dominican Republic, a survey conducted under the auspices of the Brookings Institution; 410 pp., The Brookings Institution, Washington, D. C., 1942. Describes origin of refugee movement, economic, and other factors affecting it, and organization of settlement. Also gives economic survey of Dominican Republic and assays future possibilities for refugee settlement. Valuable appendixes include rainfall charts and industrial opportunities.

Beginning Spanish, Latin American Culture, by William Samuel Hendrix; 243 pp.; Harper and Brothers, New York, 1943. Grammar, exercises, and questionnaires.

Chilean Cooperatives

A former President of Chile maintained that his countrymen should study their living conditions and "the way to improve them through cooperatives." This admonition appears to have been taken to heart if one can gage improvement by the number and variety of cooperatives being established.

by JAMES PARKER WILSON

Chileans have shown an interest in cooperatives for a number of years, although existing legislation under which they were provided dates only from 1939. Various private groups, as well as agricultural societies and government agencies, maintain units devoted to the promotion, extension, financing, and other phases of the cooperative movement in the country. Two of the foremost basic laws in this field are the Agricultural Cooperatives Act, which is the general law, and the Small Farmers' Cooperatives Act. The Department of Cooperatives of the Chilean Ministry of Agriculture is empowered to administer the former, and Small Farmers' Cooperatives are under the control of a branch of the *Caja de Crédito Agrario*, The Agrarian Credit Bank.

Nearly all known types of cooperatives have been undertaken in Chile; some have been quite successful, others have had some degree of success, and still others, unfortunately, have failed completely. The principal types are agricultural (usually quite all-inclusive), beekeeping, dairying, livestock, fruit, silk, wine, consumers', garden-orchard, housing, producers', and workers'.

Most of the agricultural cooperatives are quite naturally located in the great Central Valley, where cereals and fruits abound and about 99 percent of the country's crops are grown. The Agricultural Cooperative of Frutillar, Ltd., in the Province of Llanquihue, near Lake Llanquihue, is an outstanding example of a successful organization engaged in general agricultural activities. It is capitalized at 1,587,000 pesos (according to the free rate, 1 peso is equal to about 3.23 U. S. cents). The members, who total 368, received the following returns for deliveries made to the cooperative during the year ended June 30, 1942: 4,078,677 pesos for wheat, 1,928,276 for butter, 1,185,800 for potatoes, 30,400 for oats, 640,253 for hogs, and 129,854 pesos for wool.

This cooperative owns a granary and a drier that handles about 185 bushels of wheat per hour. It has under construction a new storehouse that will have another grain drier. Loans have been granted to this organization by the Government, the Corporation for the Development of Production, and the Institute of Agricultural Economy in the amounts of 100,000, 400,000, and 500,000 pesos, respectively. Another special loan has been negotiated from the Corporation for the Development of Production for the purpose of building a granary in nearby Corte Alto.

A similar organization, the Cooperative of Puerto Varas, Ltd., is also in the Province of Llanquihue. It recently increased its capital from 772,000 to 1,272,000 pesos, in order to construct a granary with a capacity for 6,600 short tons of grain. Its members, totaling 158, receive about 2 million pesos a year for their butter, wheat, potato, and wool deliveries. A grain drier, capable of drying about 11,000 pounds of grain per hour, has been furnished by the Ministry of Agriculture to be installed in the new granary. A loan of 500,000 pesos was granted to this cooperative by the *Corporación de Fomento*.

The Elqui-Hurtado Cooperative, Ltd., is very important to Chile's economy in the region of the "Little North" (*Norte Chico*) surrounding Coquimbo in that it is composed of most of the principal producers of dried fruits in Chile. During the last few years the cooperative has undergone a number of reorganizations; it is trying to stimulate the exportation of Chilean dried fruits as well as to give some stability to prices and the operations of the numerous small producers of raisins and other fruits dried in the valleys of the Elqui zone.

This cooperative was capitalized at about 100,000 pesos. The annual value of the combined output of the members, in normal times, was about 2,500,000 pesos.

Farm and dairy interests established the Agricultural and Dairying Cooperative, Ltd., at Santiago, the capital city. It is composed of 390 members and on April 30, 1942, was capitalized at 1.6 million pesos. Through sales of milk and other products its gross income during 1941–42 totaled nearly 46 million pesos. A mill owned by the organization produces concentrated feedstuffs for cattle, which are sold under the trade names, "Huacho and Huachito."

The principal milk producers around the great Pacific port of Valparaiso, Chile's second largest city, formed the Agricultural and Dairying Cooperative of Valparaiso and Aconcagua, Ltd. Its members delivered to the Pasteurizing Plant of the Aconcagua Dairy Union nearly 2 million gallons of milk during January-November 1942.

By purchasing preferred stock in the Aconcagua Dairy Union, the members hope to gain control of the pasteurizing plant.

Another combination organization is the Cautín Agricultural and Dairying Cooperative, Ltd., of Temuco, which is the gateway to the lake district and the grain center, or "Chicago," of Chile. It receives about 250,000 gallons of fresh milk a year from its 29 members, about three-fourths of which are pasteurized for local consumption, and about 44,000 pounds of butter are produced annually. In 1941 its gross income amounted to about 5 million pesos.

Model Dairy Cooperative

The Bío-Bío Dairy Cooperative, Ltd., of Los Angeles and Concepción, has been one of the most successful cooperatives in Chile. It gathers milk from farmers in and around the city of Los Angeles in the Bío-Bío River region. It receives more than 2,200,000 pounds of milk per year and prepares annually about 77,000 pounds of butter and 88,000 pounds of cheese. The Tilsitter cheese made by this cooperative is a great favorite and finds its best market in Magallanes, the great sheep-raising and wool-producing territory of southern Chile, which is largely dependent upon other sections for its food supplies. Other market outlets for the products of the cooperative are in Los Angeles, Concepción, and Valparaiso.

Although this cooperative is the smallest of its kind, it is a model establishment as a result of excellent administration. Government credit grants of 200,000 and 90,000 pesos, respectively, are being refunded regularly, and it has recently borrowed an additional sum from the Corporation for the Development of Production for the purpose of enlarging its various installations.

The Fruit Cooperative of Angol was formed by the leading apple producers in the Malleco region. This organization, among other things, classifies, standardizes, and packs the fruit of the growers included in its membership for both foreign and domestic markets. The Angol Packing House, which belongs to the cooperative, was constructed at a cost of over a million pesos. In normal times the sales of apples packed by this agency for shipment abroad brought a return to the growers of almost a million pesos. The capital of the cooperative exceeds 100,000 pesos, and it has 20 members.

The Silk Culture Cooperative of Elqui is very small, but it is engaged in the interesting activity of developing a silk industry in the Elqui Valley of the Province of Coquimbo. It has a capital of 10,000 pesos divided into 500 shares valued at 20 pesos per share. The Agricultural Economy Institute and the Chilean Ministry of Agriculture have aided in the work of this cooperative.

In the Province of Maule, which forms a part of the principal grape-growing section of Chile, between Santiago and the Bío-Bío River, is one of the interesting cooperative undertakings by wine producers, the *Cooperativa Vitivinicola de Cauquenes*. It has 78 members and is capitalized at 2,555,000 pesos. Gross profits approximate 5,000,000 pesos a year. During 1942 it produced about 240,000 gallons of wine on the grounds of the Experimental Station of the Ministry of Agriculture. Its members are now considering the purchase of the station from the Government in order that they may erect new buildings on the grounds.

The Cauquenes cooperative has many plans that it hopes to develop over a period of years. At present it is constructing a warehouse on its own grounds adjoining the State Railway station. In 1942 it began the elaboration of sparkling wine, making about 12,000 gallons at the first trial. This is a product of quality that may have export possibilities.

Only a few of Chile's many cooperatives have been discussed, but they give some idea of the scope of such undertakings. Among the agencies that have encouraged and established cooperatives is the *Caja de Colonización Agrícola*. This government organization, which purchases large farm properties and colonizes them with Chileans, has sponsored cooperatives in its various colonies that extend from Arica in the north to Puerto Montt in the south. The *Instituto del Inquilino* (Tenant Farmers' Institute), which is a part of the Institute of Agricultural Economy, helps the farmers, particularly those interested in beekeeping, to form small cooperatives. Producers' and consumers' cooperatives are promoted by the Commissariat of Subsistence and Prices. The law establishing the Commissariat states that it "shall stimulate the formation of cooperatives of production to the end that central purchasing agencies may eventually be established."

The Ministry of Labor sponsors the formation of workers' cooperatives of various types, and the People's Housing Administration is active in promoting not only cooperative housing projects but workers' garden and orchard cooperatives as well. The latter are especially strong in the Santiago region.

Federation Formed

As a result of the recommendations made at the United Nations Conference on Food and Agriculture, held at Hot Springs, Va., the National Agricultural Society of Chile, in line with the policy of its newly elected president, Sr. Joaquín Echeñique, sponsored last summer the organization of a federation of agricultural cooperatives, *Federación de Cooperatives Agrícolas, Ltda.* The society's offices in Santiago are headquarters for the federation, and its officers and directors were chosen from members of prominent agricultural and related cooperatives throughout Chile.

ALONG THE *Agricultural Front*

▲ STICA Undertakes Projects in Paraguay

The *Servicio Tecnico Interamericano de Cooperación Agrícola* (STICA), an agency set up within the Paraguayan Ministry of Agriculture, is carrying forward a number of vital projects designed to improve agricultural and related activities in Paraguay.

One of the projects is the improvement of cattle breeds on a 25,000-acre ranch in the rich grazing country of the Misiones, south of Asunción. The ranch, which was turned over to STICA after the signing of a food agreement between the Institute of Inter-American Affairs and the Paraguayan Government, was already stocked with 5,000 head of cattle, besides several hundred horses, mules, and sheep. Breeds are to be improved and a seeding experiment inaugurated designed to raise the best grasses, legumes, and other supplemental feeds for the cattle. Boys with a liking for ranch life will be trained to act as ranch hands and, after special study abroad, to introduce new methods into other ranching areas of the Republic.

A second project is an Experiment Station, *Instituto Agronómica Nacional*, near Caacupé. Here two small model farms are to be operated by native Paraguayan farmers under STICA direction. The aim is not to revolutionize local farming practices by radical innovations, but to utilize average available facilities to their greatest possible advantage.

Another undertaking of immediate practical importance is a dairy project being developed at San Lorenzo on land near the National Agricultural School. A modern milking stable for 100 cows, and pasteurizing equipment purchased from Brazil, will make possible the production of about 400 gallons of sanitary, high-grade milk for daily distribution to families and school children in Asunción.

▲ Peru Domesticating the Vicuña, Source of Fine Wool

If you should buy an overcoat made of vicuña wool, you would pay from $350 to $400 for it.

The wool comes from a hardy, gazellelike little animal, about 2 feet high at the shoulder, which lives 14,000 to 16,000 feet above sea level in the upper valleys of the Andes. Like the llama, alpaca, and guanaco, the vicuña is related to the camel. After it had been hunted almost to extinction, both Bolivia and Peru passed strict laws to protect it, and now some 300 of the rare little animals are being successfully domesticated on a *hacienda* near Puno in the Peruvian plateau region.

The vicuña's wool is said to be the softest of all known animal fibers. At present it is sheared from living animals, whereas in the past the fleece was removed after the animals were slain.

▲Costa Rica Establishes New Agricultural Organization

Costa Rica has, by decree, set up an organization known as the *Centro Nacional de Agricultura*, which is to work in close cooperation with the Ministry of Agriculture and Industries and with the Executive Power. The plan is to establish, in different parts of the country, Experimental Agricultural Stations.

▲Panama Developing Abacá Plantations

The abacá plantations at Bocas del Toro, in Panama, have developed to such a point that 4,000 employees are now carried on the pay roll, which amounts to $100,000 monthly.

At Changuinola the present exportation of fiber is some 175,000 pounds per month, and new fiber-extraction machinery is being installed which should greatly increase that amount.

Perhaps even more important than fiber export is that of abacá seed. The Bocas del Toro product is of such excellent quality that large amounts are being sent regularly to neighboring republics, especially Costa Rica and Guatemala.

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AGRICULTURE IN THE AMERICAS HALLY H. CONRAD, EDITOR

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Gifts of the Americas

THE TOMATO

by KATHRYN H. WYLIE

The tomato used so extensively on our tables today is a comparatively new food. Records of its production go back less than 400 years, in contrast to the 4,000-year record of wheat culture. The Incas and Aztecs may have cultivated the tomato, however, long before 1500, for at the time of the conquest it was a highly developed garden plant. Ancient Peru and old Mexico are the original homes of this versatile fruit, which takes its name from the Aztec word *xitomate,* or *zitotomate.* Peruvian tomatoes of the small "cherry" variety and the larger rough-skinned tomatoes of Mexico belong to the same family as the potato and eggplant.

Like so many other products native to tropical America, the tomato was first taken to Europe, where it was used for a hundred years before it became popular in the United States. Italy was eating tomatoes as early as 1554 but calling them golden apples; later France adopted the fruit as the *Pomme d'Amour* or love apple. The peoples of northern Europe and the United States were, however, afraid to eat the tomato, or "wolf peach" as some called it; they thought it was poisonous or at the very least would cause cancer. The plant was grown in gardens only as a curiosity or for the beauty of its fruit. Not until the latter part of the eighteenth century was it cultivated for food in the United States. Virginia first reported its cultivation for this purpose in 1781, and New Orleans market quotations of 1812 testify to the commercial production of tomatoes in the South early in the nineteenth century.

Now that we know the valuable food properties of the tomato as well as its rich provision of the health-giving vitamins C, A, and B, the United States is the leading producer. The plant is grown commercially in every State in the Union and occupies the second largest acreage of commercial fresh vegetables, outdistanced only by the potato. In the United States alone more than 24 million bushels of tomatoes are marketed fresh every year, and almost 3 million tons are sold for processing. These amounts do not include the large quantities grown for home use and canning, which probably equal another million tons a year.

In spite of such production, however, the importation of 66,000 tons was necessary in 1940–41 to meet consumer demand for this food. Reports from Brazil now indicate the commercial value of tomato seed for oil. The oil is edible, of high vitamin content, and can be used as a drying agent in varnishes.

The many modern varieties of tomato all stem from the red, gold, pale yellow, and white types cultivated in ancient Peru and Mexico. Today we use them for our breakfast as iced juice or yellow tomato preserves; for our lunch in their natural state, luscious slices of ripe red fruit; and for dinner as catsup or sauce on our precious steaks.

PANAMA

Land

The narrow isthmus of Panama runs east and west to connect the two American continents. It is crossed at its narrowest point by the 50-mile-long Canal that provides a vital link between the Atlantic and Pacific Oceans. The total land area of the Republic is estimated at 29,000 square miles, much of which is capable of agricultural production, but little of which is cultivated. Two mountain ranges and almost 500 rivers are contained in the tiny country.

Climate

All of Panama is in the Tropics, and the coastal interior lowlands are hot and humid. The annual average temperature on the coast is about 80° F. with little seasonal variation, and that higher up in the mountains is 66° F. The Atlantic coast receives about 140 inches of rain a year, the Pacific 60, and the interior 93 inches, most of the fall coming during the rainy season from May through December.

Population

About two-thirds of Panama's population of 632,000 are rural, and of this total about 65,000 are tribal Indians. Population density is greatest in the provinces just west of the Canal Zone, and the urban dwellers are concentrated largely in Colón and Panamá City.

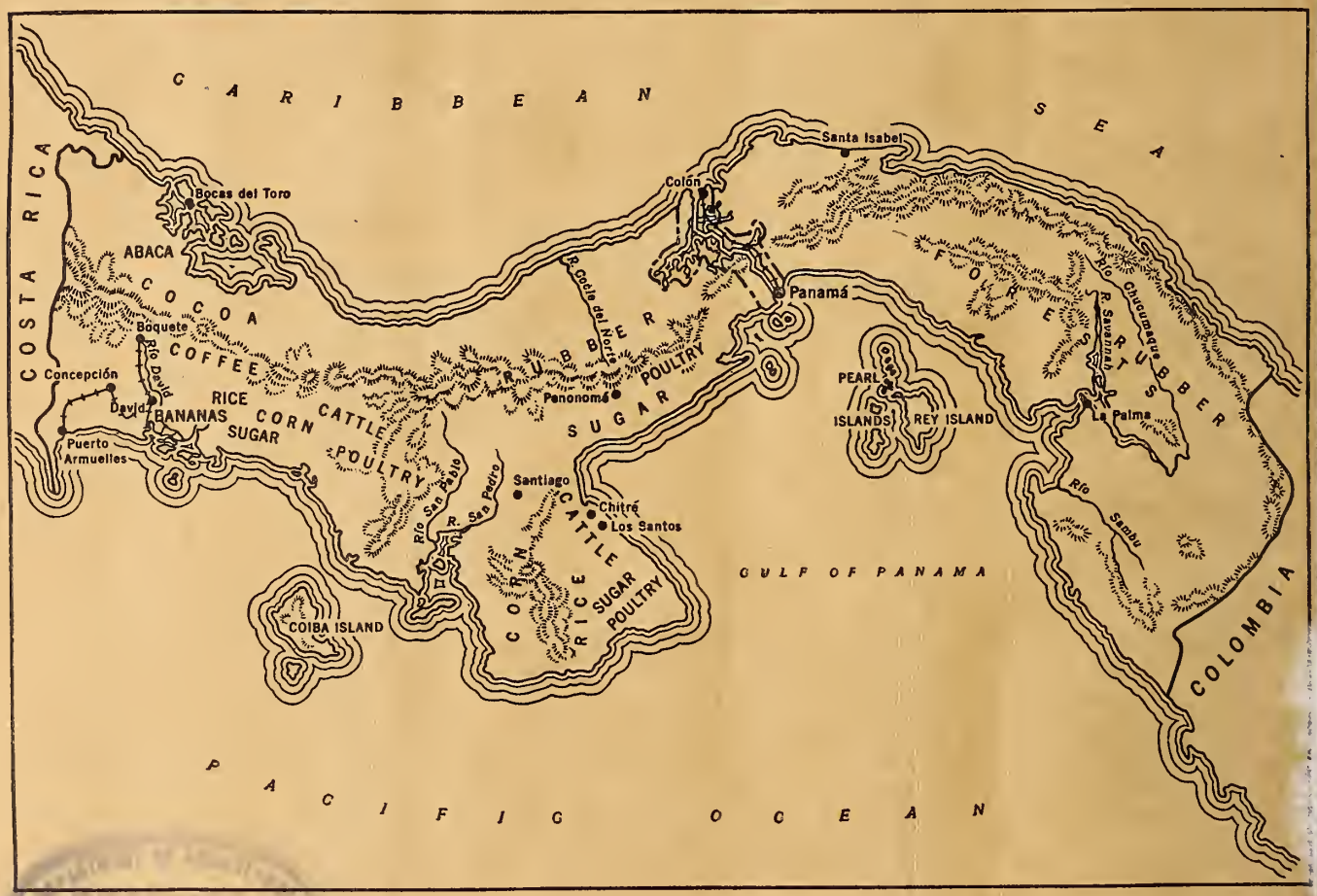
Agriculture

Although heavy imports of food and other agricultural products are made to supply the urban population of the Republic and the Canal Zone, the rural people of Panama produce enough food to supply their own needs. In addition, bananas and cacao are produced for export.

The principal food crops—rice, corn, yuca, plantains, sugarcane, beans, and potatoes—are grown largely in the four provinces of Coclé, Chiriquí, Los Santos, and Veraguas on the Pacific coast west of the Canal. Domestic production usually is sufficient to supply the home market for all these products except rice and potatoes. About half the requirements of rice and potatoes are imported, however, as well as large quantities of wheat flour, fats and oils, malt, meats, and canned milk.

Cattle and poultry are important sources of food in Panama. Chiriquí has more cattle than any other province and Los Santos more poultry, although all provinces have at least small numbers of cattle, hogs, and poultry.

The Government has inaugurated a new farm program, under which agricultural production is expanding, particularly of commodities destined for home consumption.



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